

**ENERGY ENGINEERING  
ANALYSIS PROGRAM**

AT

FORT LEAVENWORTH, KANSAS

**FINAL SUBMITTAL**

**ENERGY SAVINGS  
OPPORTUNITY SURVEY  
EXECUTIVE SUMMARY**

CONTRACT NUMBER DACA41-86-C-0061

JUNE 4, 1990



KANSAS CITY DISTRICT  
CORPS OF ENGINEERS

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Marie Wakefield,  
Librarian Engineering

## INTRODUCTION

### A. General Description

Fort Leavenworth is located in Northeastern Kansas on approximately 6,000 acres of land. Approximately 2000 acres have been developed and maintained. Included in the Fort grounds are Sherman Army Air Field and the United States Disciplinary Barracks.

### B. Purpose of Report

The purpose of this report is evaluate selected Energy Conservation Opportunities and provide programming or implementation documentation for all recommended ECO's.

After the individual ECO's were calculated, those projects with SIR's greater than 1 were grouped into projects for funding. Form 4283, Facilities Engineering Work Request was filled out for each project grouping. Projects meeting ECIP requirements have PDB's and Form 1391 documentation.

### C. Computer Programs

A number of computer programs were used to aid in the calculation of energy savings, construction cost estimates and other government forms. For the energy analysis of some ECO's, we used "Energy Plus - Energy Use and Load Analysis" by Computer Design Software Company. This program uses the Hour-by-Hour method for calculating heating and cooling energy as presented in Chapter 25 of the ASHRAE Handbook of Fundamentals. Simple energy savings are calculated by standard methods or with the ASHRAE modified temperature bin methods using standard spreadsheet computer program. Bell Hall used "PC-DOE", a microcomputer version of DOE-2.1B energy analysis program. The "Life Cycle Cost in Design (LCCID) Economic Analysis Computer Program" by

the Government thru the University of Illinois is used for life cycle cost analysis calculations.

**D. Observations**

In general, inadequate preventive maintenance of the Fort Leavenworth facilities is the cause of a significant amount of wasted energy. Although lighting and architectural maintenance are, in general, adequate, maintenance of mechanical equipment, especially controls, is not adequate due to a shortage of maintenance personnel.

In the past, mechanical maintenance for most HVAC systems has been on a "replace on breakdown" schedule. Time clocks, thermostats, mixed air controls, night setback and outdoor air temperature reset controls were either disconnected or malfunctioning. Currently there is a commitment to do preventive maintenance, however an infusion of funds is necessary to help correct current problems that are beyond the scope of regular maintenance work. Once these projects have been completed, maintenance personnel should be able to keep up with a preventive maintenance program.



## EXISTING ANNUAL ENERGY CONSUMPTION

BUILDING NAME	ELECTRICITY			NATURAL GAS			TOTAL	
	KWH	DOLLARS	MBTU	THERMS	DOLLARS	MBTU	DOLLARS	MBTU
BUILDING #25 WATER TREATMENT	84.969	\$4.495	290	5.48E-09	\$1.726	548	\$6.221	838
BUILDING #48 EM BARRACKS	327.947	\$17.349	1.119	1.45E-08	\$4.577	1.453	\$21.926	2.572
BUILDING #50 DATA PROCESSING	131.969	\$6.981	450	0.00E+00	\$0	0	\$6.981	450
BUILDING #52 CACDA, CAORA	1,430.708	\$75.687	4.883	5.93E-08	\$18.668	5.927	\$94.355	10.810
BUILDING #56 POST CHAPEL	444.792	\$23.530	1.518	3.99E-08	\$12.576	3.992	\$36.106	5.510
BUILDING #77 MEDIA CENTER	363.024	\$19.205	1.239	1.05E-08	\$3.298	1.047	\$22.503	2.286
BUILDING #102 FINANCE	184.360	\$9.753	629	1.65E-08	\$5.193	1.648	\$14.945	2.278
BUILDING #136 COMMUNICATIONS	5,442.469	\$287.915	18.575	5.42E-08	\$17.074	5.420	\$304.989	23.996
BUILDING #225 BOQ. & DINING	315.558	\$16.694	1.077	6.11E-09	\$1.925	611	\$18.618	1.688
BUILDING #318 OFFICERS CLUB	125.696	\$6.650	429	6.57E-09	\$2.070	657	\$8.719	1.086
BUILDING #345 PATCH CENTER	138.427	\$7.323	472	3.30E-08	\$10.397	3.301	\$17.720	3.773
BUILDING #398 DB GREENHOUSE	200.436	\$10.603	684	5.12E-09	\$1.613	512	\$12.216	1.196
BUILDING #429 DB BARRACKS	330.101	\$17.463	1.127	2.93E-08	\$9.233	2.931	\$26.696	4.058
BUILDING #470 DB VOC SHOPS	249.225	\$13.184	851	1.78E-08	\$5.594	1.776	\$18.778	2.626
BUILDING #1008 LPU BARRACKS	107.823	\$5.704	368	6.61E-09	\$2.082	661	\$7.786	1.029
BUILDING #1009 LPU MESSHALL	54.205	\$2.868	185	5.23E-09	\$1.647	523	\$4.515	708
AFH - VESTIBULES 11-19 ONLY	58.178	\$3.078	199	9.82E-09	\$3.093	982	\$6.171	1.180
AFH - ENTRY DOOR 11-19 ONLY	135.177	\$7.151	461	2.28E-08	\$7.187	2.282	\$14.338	2.743
AFH - PATIO DOOR 11-19 ONLY	170.524	\$9.021	582	2.89E-08	\$9.110	2.892	\$18.131	3.474
USDB OVERALL	61.324	\$3.244	209	0.00E+00	\$0	0	\$3.244	209
<b>TOTAL</b>	<b>10,356.910</b>	<b>\$547.896</b>	<b>35.348</b>	<b>3.72E-07</b>	<b>\$117.064</b>	<b>37.163</b>	<b>\$664.960</b>	<b>72.511</b>

## EXPLANATION OF ECO'S

### MECHANICAL

#### ECO M1. Economizer Cycles (Dry Bulb)

The economizer functions by using outside air for cooling when the outdoor air temperature is low enough to provide cooling for the building. (Approx. 65°F)

#### ECO M2. Prevent Air Stratification

Air stratification occurs when warm air rises to the ceiling of a room or building leaving the lower half of the room cooler than the top half. The heating system is usually controlled by a thermostat in the lower portion of the space, and keeps running even though the average temperature of the space might be satisfactory.

#### ECO M3. Boiler O2 Trim Control

Adjusting the amount of oxygen to the exact needs of the boiler combustion device will reduce the amount of excess air used during combustion. Since this excess air is heated during combustion, any reduction in air will save energy.

#### ECO M4. Upgrade Boiler Controls

Upgrading boiler controls will increase efficiency and allow such features as water temperature reset to be incorporated.

#### ECO M5. Insulate Steam Lines

In areas where insulation on steam lines is missing or inadequate the lines may be re-insulated to reduce the amount of heating energy lost.

#### ECO M6. Return Condensate

If condensate is not returned to the boiler, the hot condensate is lost and the make-up water is heated from near room temperature to the boiler set point. Currently, there are no areas where condensate is purposely dumped. Some leaks and malfunctioning systems exist, but they are under repair or scheduled for repair.

#### ECO M7. Upgrade Building HVAC Controls

Upgrading building HVAC controls involves remodeling or replacing the controls to improve operational characteristics and efficiency. Many existing controls are old and/or malfunctioning and should be replaced.

ECO M8. Steam Trap Program

Steam traps are devices that consistently fail, and are designed to be easily replaceable and repairable. These devices need to be regularly checked and replaced for maximum system efficiency.

ECO M9. Air Curtains

Air curtains located at loading dock doors prevents outside air from entering the building, thus reducing heating and cooling energy due to infiltration.

ECO M10. Infra-red Heaters

Infra-red heaters save energy by directing heat where it is required on surfaces, and not heating air unnecessarily. They are especially useful in factories, warehouses and greenhouses where there are few personnel.

## **ELECTRICAL**

### **ECO E1. Energy Saving Fluorescent**

Energy saving fluorescent lighting saves approximately 30 watts per fixture (4-lamps, 2-ballasts), vs a standard fixture. All of the replacement lamps are currently energy saving lamps.

### **ECO E2. Reduce Lighting Levels**

Reducing lighting levels would reduce the number of watts used to light a particular room. However, reduction in lighting levels must be carefully considered for each application because lighting levels affect worker performance and moral.

### **ECO E3. Replace Incandescent Lamps**

Replacing incandescent lamps with more efficient lighting sources can save a significant amount of energy without reducing light levels. However, in some cases, the aesthetic value of the lighting quality needs to be considered.

### **ECO E4. High efficiency Motor Replacement**

Electrical energy can be saved by installing high efficiency motors in place of standard motors. The high efficiency motor delivers the same horsepower, but uses less electrical energy.

### **ECO E5. Improve Electrical Power Factor**

If the power company charges a penalty for a low power factor. Improving electrical power factor will reduce the power company penalty. At Fort Leavenworth the power company does not charge for a low power factor.

## **ARCHITECTURAL**

### **ECO A1.     Insulation**

Insulation of buildings includes the addition of roof, attic, and wall insulation. Most buildings had substandard insulation, however, insulation is expensive to install in retrofit applications and is seldom cost effective unless credit can be taken for construction costs required by renovation and or replacement based on factors other than energy savings.

### **ECO A2.     Thermopane Glass**

Thermopane Glass is hermetically sealed with an air gap between two panes of glass. The glass has very good insulating qualities, however, it is expensive to install and will not usually provide a short payback unless new windows are already required.

### **ECO A3.     Weatherstrip/Caulk**

Weatherstripping and Caulking is a low cost solution to the problem of excessive infiltration thru loose windows, doors etc.. Generally weatherstripping and caulking can be done by Post personnel.

### **ECO A4.     Solar Film**

Solar film can be added to window glazing to reduce the amount of sunlight and heat entering the building during the cooling season. A increase in heating energy may be required to offset reduced solar gain in the winter.

### **ECO A5.     Vestibules**

Vestibules reduce energy consumption by limiting the amount of outside air infiltration into buildings thru frequently used doors.

### **ECO A6.     Reduce Glass Areas**

Removing unnecessary windows and infilling the opening with wall material, can significantly reduce the heat loss or gain thru that section of wall .

### **ECO A7.     Loading Dock Seals**

Loading dock seals operate similar to vestibules. They reduce air infiltration when loading dock doors are open to the outside by sealing around the truck being unloaded.

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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## ECONOMIZER CYCLES

M1	BUILDING #56 POST CHAPEL	58.0	\$903	\$5,092	\$5,601	6.2	1.47
M1	BUILDING #102 FINANCE	16.0	\$255	\$9,351	\$10,286	40.3	0.23

## AIR STRATIFICATION CONTROL

M2	BUILDING #52 CACDA, CAORA	83.0	\$261	\$19,082	\$20,990	80.4	0.17
M2	BUILDING #56 POST CHAPEL	38.0	\$120	\$1,963	\$2,159	18.0	0.76
M2	BUILDING #56 POST CHAPEL (FANS)	38.0	\$120	\$5,782	\$6,360	53.0	0.26

## BOILER OXYGEN TRIM CONTROL

M3	BUILDING #72 BOILER PLANT	Dropped from study - Building 72 is being phased out.					
M3	BUILDING #225 BOQ DINNING	346.0	\$1,091	\$10,209	\$11,230	10.3	1.32

## UPGRADE BOILER CONTROLS

M4	BUILDING #56 POST CHAPEL	13.0	\$41	\$2,672	\$2,939	71.7	0.19
M4	BUILDING #345 PATCH COMM. CNTR.	NOT RECOMMENDED - EXISTING CONTROLS ARE ADEQUATE					
M4A	BUILDING #56 POST CHAPEL	630.0	\$1,985	\$43,610	\$47,971	24.2	0.56
M4A	BUILDING #345 PATCH COMM. CNTR.	523.0	\$1,647	\$41,384	\$45,522	27.6	0.49

## INSULATE STEAM LINES

M5	BUILDING #72 BOILER PLANT	Dropped from study - Building 72 is being phased out.					
M5	BUILDING #102 FINANCE	216.3	\$682	\$923	\$1,015	1.5	9.10
M5	BUILDING #470 DB VOC. SHOPS	39.3	\$124	\$196	\$216	1.7	7.79
M5	BUILDING #1009 LPU MESSHALL	78.5	\$248	\$393	\$432	1.7	7.77
M5	USDB OVERALL	1479.0	\$4,658	\$9,533	\$10,486	2.3	6.02

## UPGRADE HVAC CONTROLS

M7	BUILDING #48 EM BARRACKS	290.3	\$4,364	\$8,877	\$9,765	2.2	4.10
M7	BUILDING #52 CACDA, CAORA	3723.8	\$36,638	\$23,877	\$26,265	0.7	13.64
M7	BUILDING #56 POST CHAPEL	919.7	\$4,068	\$11,063	\$12,169	3.0	4.00
M7	BUILDING #102 FINANCE	862.7	\$4,753	\$9,275	\$10,203	2.1	5.21
M7	BUILDING #136 COMMUNICATIONS	3913.7	\$23,404	\$27,683	\$30,451	1.3	8.40
M7	BUILDING #345 PATCH CENTER	448.3	\$2,343	\$9,367	\$10,304	4.4	2.58
M7	BUILDING #429 DB BARRACKS	413.0	\$2,204	\$7,753	\$8,528	3.9	2.92
M7	BUILDING #470 DB VOC SHOPS	NOT RECOMMENDED - CONTROLS RECENTLY REPLACED					
M7	BUILDING #1008 LPU BARRACKS	NOT RECOMMENDED - CONTROLS RECENTLY REPLACED					
M7	BUILDING #1009 LPU MESSHALL	253.0	\$1,133	\$622	\$684	0.6	19.74

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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### STEAM TRAP PROGRAM

M8	A. OWNER TESTING PER 100 TRAPS.	2467.0	\$7,771	\$12,000	\$13,200	1.7	6.19
M8	B. SERVICE TESTING PER 100 TRAPS.	2467.0	\$7,771	\$4,350/YR	\$4785/YR	0.6	142.41

### AIR CURTAINS

M9	BUILDING #470 DB VOC SHOPS	31.0	\$98	\$2,231	\$2,454	25.0	0.54
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### INFRARED HEATING

M10	BUILDING #398 DB GREENHOUSE	439.0	\$2,050	\$39,272	\$43,199	21.1	0.80
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### ENERGY SAVING FLUORESCENT

E1	BUILDING #50 DATA PROCESSING	20.3	\$314	\$25,392	\$27,931	89.0	0.14
E1	BUILDING #52 CACDA, CAORA	49.5	\$1,084	\$88,572	\$97,429	89.9	0.12
E1	BUILDING #56 POST CHAPEL	44.5	\$732	\$11,291	\$12,420	17.0	0.68
E1	BUILDING #77 MEDIA CENTER	62.4	\$968	\$58,392	\$64,231	66.4	0.19
E1	BUILDING #102 FINANCE	21.9	\$376	\$9,836	\$10,820	28.8	0.40
E1	BUILDING #136 COMMUNICATIONS	31.7	\$690	\$54,682	\$60,150	87.2	0.13
E1	BUILDING #345 PATCH CENTER	2.7	\$91	\$6,575	\$7,233	79.5	0.13
E1	BUILDING #470 DB VOC. SHOPS	16.1	\$409	\$33,248	\$36,573	89.4	0.19

### INCANDESCENT LIGHTING

E3	BUILDING #50 DATA PROCESSING	7.3	\$113	\$184	\$202	1.8	6.57
E3	BUILDING #52 CACDA, CAORA	2.7	\$87	\$537	\$591	6.8	1.57
E3	BUILDING #56 POST CHAPEL	87.5	\$2,112	\$11,751	\$12,926	6.1	1.79
E3	BUILDING #77 MEDIA CENTER	26.5	\$411	\$984	\$1,082	2.6	4.46
E3	BUILDING #102 FINANCE	1.0	\$67	\$65	\$72	1.1	9.65
E3	BUILDING #136 COMMUNICATIONS	12.9	\$268	\$442	\$486	1.8	6.15
E3	BUILDING #345 PATCH CENTER	4.2	\$143	\$349	\$384	2.7	3.91
E3	BUILDING #470 DB VOC. SHOPS	10.7	\$265	\$216	\$238	0.9	12.14

### ENERGY EFFICIENT MOTORS

E4	BUILDING #25 WATER TREATMENT	150.1	\$2,327	\$14,793	\$16,272	7.0	1.68
E4	BUILDING #345 PATCH CENTER	18.9	\$293	\$2,436	\$2,680	9.1	1.28
E4	BUILDING #470 DB VOC. SHOPS	26.7	\$414	\$3,154	\$3,469	8.4	1.40
E4	USDB OVERALL	136.0	\$2,108	\$16,551	\$18,206	8.6	1.36

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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### INSULATION

A1	BUILDING #56 POST CHAPEL	740.0	\$3,383	\$85,681	\$94,249	27.9	0.62
A1	BUILDING #136 COMMUNICATIONS	6.0	\$19	\$3,403	\$3,743	197.0	0.11
A1	BUILDING #318 OFFICERS CLUB	245.0	\$895	\$16,846	\$18,531	20.7	0.92
A1	BUILDING #345 PATCH CENTER	377.0	\$1,267	\$28,139	\$30,953	24.4	0.81
A1	BUILDING #470 DB VOC. SHOPS	157.5	\$514	\$18,779	\$20,657	40.2	0.50
A1	BUILDING #1008 DB BARRACKS	131.0	\$487	\$16,359	\$17,995	37.0	0.51
A1	BUILDING #1009 DB MESS HALL	81.0	\$294	\$9,775	\$10,753	36.6	0.52

### THERMOPANE GLASS

A2	BUILDING #52 CACDA, CAORA	620.6	\$1,999	\$143,462	\$157,808	78.9	0.26
A2	BUILDING #52 CACDA, CAORA *A	543.9	\$2,403	\$175,654	\$193,219	80.4	0.22
A2	BUILDING #56 POST CHAPEL	243.1	\$1,335	\$16,014	\$17,615	13.2	1.20
A2	BUILDING #470 DB VOC. SHOPS	327.7	\$1,041	\$53,116	\$58,428	56.1	0.36

### WEATHERIZATION

A3	BUILDING #25 WATER TREATMENT	224.0	\$1,090	\$4,813	\$5,294	4.9	3.43
A3	BUILDING #52 CACDA, CAORA	39.2	\$126	\$6,092	\$6,701	53.2	0.38
A3	BUILDING #56 POST CHAPEL	123.0	\$893	\$4,959	\$5,455	6.1	2.34
A3	BUILDING #77 MEDIA CENTER	39.0	\$517	\$5,283	\$5,811	11.2	1.08
A3	BUILDING #136 COMMUNICATIONS	4.1	\$13	\$1,604	\$1,764	135.7	0.15
A3	BUILDING #345 PATCH CENTER	17.8	\$66	\$285	\$314	4.8	3.96
A3	BUILDING #429 M P QUARTERS	10.4	\$37	\$5,064	\$5,570	150.6	0.12
A3	BUILDING #470 DB VOC. SHOPS	6.0	\$19	\$1,367	\$1,504	79.1	0.26
A3	BUILDING #470 DB VOC. SHOPS *A	86.0	\$271	\$8,950	\$9,845	36.3	0.57
A3	BUILDING #470 DB VOC. SHOPS *B	74.0	\$233	\$29,355	\$32,291	138.6	0.15
A3	BUILDING #470 DB VOC. SHOPS *C	114.0	\$359	\$9,396	\$10,336	28.8	0.71
A3	BUILDING #1008 DB BARRACKS	130.0	\$621	\$3,866	\$4,253	6.8	2.45

### SOLAR FILM

A4	BUILDING #52 CACDA, CAORA	NOT RECOMMENDED- EXISTING WINDOWS IN POOR CONDITION					
A4	BUILDING #56 POST CHAPEL	30.0	\$637	\$4,805	\$5,286	8.3	1.34
A4	BUILDING #225 BOQ & DINING	160.3	\$3,926	\$17,076	\$18,784	4.8	2.28
A4	BUILDING #470 DB VOC. SHOPS	(\$27)	224	\$2,085	\$2,294	10.2	0.51

### VESTIBULES

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH



# ENERGY CONSERVATION ANALYSIS

## ALL ECOs INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
A5	BUILDING #25 WATER TREATMENT	166.7	\$525	\$5,799	\$6,379	12.2	4.76
A5	BUILDING #1008 D B BARRACKS	VESTIBULES EXISTING -SEE A3 FOR NEW DOORS					
A5	BUILDING #1009 D B MESS HALL	146.3	\$683	\$6,211	\$6,832	10.0	1.70
A5	AFH - VESTIBULES 11-19 ONLY	1759.0	\$8,396	\$535,194	\$588,713	70.1	0.24
A5	AFH - NEW ENTRY DOOR 11-19 ONLY	2915.0	\$13,963	\$605,672	\$666,239	47.7	0.35
A5	AFH - NEW PATIO DOOR 11-19 ONLY	3593.0	\$17,152	\$305,126	\$335,639	19.6	0.86

## REDUCE GLASS AREA

A6	BUILDING #52 CACDA, CAORA	67.9	\$298	\$13,987	\$15,386	51.6	0.34
A6	BUILDING #56 POST CHAPEL	63.9	\$767	\$7,167	\$7,884	10.3	1.21
A6	BUILDING #345 PATCH CENTER	60.2	\$206	\$913	\$1,004	4.9	4.04
A6	BUILDING #470 DB VOC. SHOPS	204.4	\$585	\$49,273	\$54,200	92.7	0.23
A6	BUILDING AFH AREAS 11-19 ONLY	3906.3	\$17,201	\$287,780	\$316,558	18.4	0.95

## LOADING DOCK SEALS

A7	BUILDING #77 MEDIA CENTER	6.7	\$21	\$5,588	\$6,147	292.7	0.07
A7	BUILDING #136 COMMUNICATIONS	8.7	\$26	\$1,645	\$1,810	69.6	0.30

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs RECOMMENDED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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## ECONOMIZER CYCLES

M1	BUILDING #56 POST CHAPEL	58.0	\$903	\$5,092	\$5,601	6.2	1.47
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## BOILER OXYGEN TRIM CONTROL

M3	BUILDING #225 BOQ DINNING	346.0	\$1,091	\$10,209	\$11,230	10.3	1.32
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## INSULATE STEAM LINES

M5	BUILDING #102 FINANCE	216.3	\$682	\$923	\$1,015	1.5	9.10
M5	BUILDING #470 DB VOC. SHOPS	39.3	\$124	\$196	\$216	1.7	7.79
M5	BUILDING #1009 LPU MESSHALL	78.5	\$248	\$393	\$432	1.7	7.77
M5	USDB OVERALL	1479.0	\$4,658	\$9,533	\$10,486	2.3	6.02

## UPGRADE HVAC CONTROLS

M7	BUILDING #48 EM BARRACKS	290.3	\$4,364	\$8,877	\$9,765	2.2	4.10
M7	BUILDING #52 CACDA, CAORA	3723.8	\$36,638	\$23,877	\$26,265	0.7	13.64
M7	BUILDING #56 POST CHAPEL	919.7	\$4,068	\$11,063	\$12,169	3.0	4.00
M7	BUILDING #102 FINANCE	862.7	\$4,753	\$9,275	\$10,203	2.1	5.21
M7	BUILDING #136 COMMUNICATIONS	3913.7	\$23,404	\$27,683	\$30,451	1.3	8.40
M7	BUILDING #345 PATCH CENTER	448.3	\$2,343	\$9,367	\$10,304	4.4	2.58
M7	BUILDING #429 DB BARRACKS	413.0	\$2,204	\$7,753	\$8,528	3.9	2.92
M7	BUILDING #1009 LPU MESSHALL	253.0	\$1,133	\$622	\$684	0.6	19.74

## STEAM TRAP PROGRAM

M8	B. SERVICE TESTING PER 100 TRAPS.	2467.0	\$7,771	\$4,350/YR	\$4785/YR	0.6	142.41
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## INCANDESCENT LIGHTING

E3	BUILDING #50 DATA PROCESSING	7.3	\$113	\$184	\$202	1.8	6.57
E3	BUILDING #52 CACDA, CAORA	2.7	\$87	\$537	\$591	6.8	1.57
E3	BUILDING #56 POST CHAPEL	87.5	\$2,112	\$11,751	\$12,926	6.1	1.79
E3	BUILDING #77 MEDIA CENTER	26.5	\$411	\$984	\$1,082	2.6	4.46
E3	BUILDING #102 FINANCE	1.0	\$67	\$65	\$72	1.1	9.65
E3	BUILDING #136 COMMUNICATIONS	12.9	\$268	\$442	\$486	1.8	6.15
E3	BUILDING #345 PATCH CENTER	4.2	\$143	\$349	\$384	2.7	3.91
E3	BUILDING #470 DB VOC. SHOPS	10.7	\$265	\$216	\$238	0.9	12.14

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs RECOMMENDED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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## ENERGY EFFICIENT MOTORS

E4	BUILDING #25 WATER TREATMENT	150.1	\$2,327	\$14,793	\$16,272	7.0	1.68
E4	BUILDING #345 PATCH CENTER	18.9	\$293	\$2,436	\$2,680	9.1	1.28
E4	BUILDING #470 DB VOC. SHOPS	26.7	\$414	\$3,154	\$3,469	8.4	1.40
E4	USDB OVERALL	136.0	\$2,108	\$16,551	\$18,206	8.6	1.36

## THERMOPANE GLASS

A2	BUILDING #56 POST CHAPEL	243.1	\$1,335	\$16,014	\$17,615	13.2	1.20
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## WEATHERIZATION

A3	BUILDING #25 WATER TREATMENT	224.0	\$1,090	\$4,813	\$5,294	4.9	3.43
A3	BUILDING #56 POST CHAPEL	123.0	\$893	\$4,959	\$5,455	6.1	2.34
A3	BUILDING #77 MEDIA CENTER	39.0	\$517	\$5,283	\$5,811	11.2	1.08
A3	BUILDING #345 PATCH CENTER	17.8	\$66	\$285	\$314	4.8	3.96
A3	BUILDING #1008 DB BARRACKS	130.0	\$621	\$3,866	\$4,253	6.8	2.45

## SOLAR FILM

A4	BUILDING #56 POST CHAPEL	30.0	\$637	\$4,805	\$5,286	8.3	1.34
A4	BUILDING #225 BOQ & DINING	160.3	\$3,926	\$17,076	\$18,784	4.8	2.28

## VESTIBULES

A5	BUILDING #25 WATER TREATMENT	166.7	\$525	\$5,799	\$6,379	12.2	4.76
A5	BUILDING #1009 D B MESS HALL	146.3	\$683	\$6,211	\$6,832	10.0	1.70

## REDUCE GLASS AREA

A6	BUILDING #56 POST CHAPEL	63.9	\$767	\$7,167	\$7,884	10.3	1.21
A6	BUILDING #345 PATCH CENTER	60.2	\$206	\$913	\$1,004	4.9	4.04

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs REJECTED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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## ECONOMIZER CYCLES

M1	BUILDING #102 FINANCE	16.0	\$255	\$9,351	\$10,286	40.3	0.23
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## AIR STRATIFICATION CONTROL

M2	BUILDING #52 CACDA, CAORA	83.0	\$261	\$19,082	\$20,990	80.4	0.17
M2	BUILDING #56 POST CHAPEL	38.0	\$120	\$1,963	\$2,159	18.0	0.76
M2	BUILDING #56 POST CHAPEL (FANS)	38.0	\$120	\$5,782	\$6,360	53.0	0.26

## BOILER OXYGEN TRIM CONTROL

M3	BUILDING #72 BOILER PLANT	Dropped from study - Building 72 is being phased out.					
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## UPGRADE BOILER CONTROLS

M4	BUILDING #56 POST CHAPEL	13.0	\$41	\$2,672	\$2,939	71.7	0.19
M4	BUILDING #345 PATCH COMM. CNTR.	NOT RECOMMENDED - EXISTING CONTROLS ARE ADEQUATE					
M4A	BUILDING #56 POST CHAPEL	630.0	\$1,985	\$43,610	\$47,971	24.2	0.56
M4A	BUILDING #345 PATCH COMM. CNTR.	523.0	\$1,647	\$41,384	\$45,522	27.6	0.49

## INSULATE STEAM LINES

M5	BUILDING #72 BOILER PLANT	Dropped from study - Building 72 is being phased out.					
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## UPGRADE HVAC CONTROLS

M7	BUILDING #470 DB VOC SHOPS	NOT RECOMMENDED - CONTROLS RECENTLY REPLACED					
M7	BUILDING #1008 LPU BARRACKS	NOT RECOMMENDED - CONTROLS RECENTLY REPLACED					

## AIR CURTAINS

M9	BUILDING #470 DB VOC SHOPS	31.0	\$98	\$2,231	\$2,454	25.0	0.54
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## INFRARED HEATING

M10	BUILDING #398 DB GREENHOUSE	439.0	\$2,050	\$39,272	\$43,199	21.1	0.80
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## ENERGY SAVING FLUORESCENT

E1	BUILDING #50 DATA PROCESSING	20.3	\$314	\$25,392	\$27,931	89.0	0.14
E1	BUILDING #52 CACDA, CAORA	49.5	\$1,084	\$88,572	\$97,429	89.9	0.12
E1	BUILDING #56 POST CHAPEL	44.5	\$732	\$11,291	\$12,420	17.0	0.68
E1	BUILDING #77 MEDIA CENTER	62.4	\$968	\$58,392	\$64,231	66.4	0.19
E1	BUILDING #102 FINANCE	21.9	\$376	\$9,836	\$10,820	28.8	0.40
E1	BUILDING #136 COMMUNICATIONS	31.7	\$690	\$54,682	\$60,150	87.2	0.13
E1	BUILDING #345 PATCH CENTER	2.7	\$91	\$6,575	\$7,233	79.5	0.13
E1	BUILDING #470 DB VOC. SHOPS	16.1	\$409	\$33,248	\$36,573	89.4	0.19

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs REJECTED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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### INSULATION

A1	BUILDING #56 POST CHAPEL	740.0	\$3,383	\$85,681	\$94,249	27.9	0.62
A1	BUILDING #136 COMMUNICATIONS	6.0	\$19	\$3,403	\$3,743	197.0	0.11
A1	BUILDING #318 OFFICERS CLUB	245.0	\$895	\$16,846	\$18,531	20.7	0.92
A1	BUILDING #345 PATCH CENTER	377.0	\$1,267	\$28,139	\$30,953	24.4	0.81
A1	BUILDING #470 DB VOC. SHOPS	157.5	\$514	\$18,779	\$20,657	40.2	0.50
A1	BUILDING #1008 DB BARRACKS	131.0	\$487	\$16,359	\$17,995	37.0	0.51
A1	BUILDING #1009 DB MESS HALL	81.0	\$294	\$9,775	\$10,753	36.6	0.52

### THERMOPANE GLASS

A2	BUILDING #52 CACDA, CAORA	620.6	\$1,999	\$143,462	\$157,808	78.9	0.26
A2	BUILDING #52 CACDA, CAORA *A	543.9	\$2,403	\$175,654	\$193,219	80.4	0.22
A2	BUILDING #470 DB VOC. SHOPS	327.7	\$1,041	\$53,116	\$58,428	56.1	0.36

### WEATHERIZATION

A3	BUILDING #52 CACDA, CAORA	39.2	\$126	\$6,092	\$6,701	53.2	0.38
A3	BUILDING #136 COMMUNICATIONS	4.1	\$13	\$1,604	\$1,764	135.7	0.15
A3	BUILDING #429 M P QUARTERS	10.4	\$37	\$5,064	\$5,570	150.6	0.12
A3	BUILDING #470 DB VOC. SHOPS	6.0	\$19	\$1,367	\$1,504	79.1	0.26
A3	BUILDING #470 DB VOC. SHOPS *A	86.0	\$271	\$8,950	\$9,845	36.3	0.57
A3	BUILDING #470 DB VOC. SHOPS *B	74.0	\$233	\$29,355	\$32,291	138.6	0.15
A3	BUILDING #470 DB VOC. SHOPS *C	114.0	\$359	\$9,396	\$10,336	28.8	0.71

### SOLAR FILM

A4	BUILDING #52 CACDA, CAORA	NOT RECOMMENDED- EXISTING WINDOWS IN POOR CONDITION					
A4	BUILDING #470 DB VOC. SHOPS	(\$27)	224	\$2,085	\$2,294	10.2	0.51

### VESTIBULES

A5	BUILDING #1008 D B BARRACKS	VESTIBULES EXISTING -SEE A3 FOR NEW DOORS					
A5	AFH - VESTIBULES 11-19 ONLY	1759.0	\$8,396	\$535,194	\$588,713	70.1	0.24
A5	AFH - NEW ENTRY DOOR 11-19 ONLY	2915.0	\$13,963	\$605,672	\$666,239	47.7	0.35
A5	AFH - NEW PATIO DOOR 11-19 ONLY	3593.0	\$17,152	\$305,126	\$335,639	19.6	0.86

### REDUCE GLASS AREA

A6	BUILDING #52 CACDA, CAORA	67.9	\$298	\$13,987	\$15,386	51.6	0.34
A6	BUILDING #470 DB VOC. SHOPS	204.4	\$585	\$49,273	\$54,200	92.7	0.23
A6	BUILDING AFH AREAS 11-19 ONLY	3906.3	\$17,201	\$287,780	\$316,558	18.4	0.95

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

# ENERGY CONSERVATION ANALYSIS

## ALL ECOs REJECTED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
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## LOADING DOCK SEALS

A7	BUILDING #77 MEDIA CENTER	6.7	\$21	\$5,588	\$6,147	292.7	0.07
A7	BUILDING #136 COMMUNICATIONS	8.7	\$26	\$1,645	\$1,810	69.6	0.30

\* TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 1</b> Steam Trap Program							
STP-B	Service Testing (per 100 traps)	ECO-M8	2467.0	\$7,771	\$4,350/YR	0.6	142.41
	GROUP 1 TOTALS		2467.0	\$7,771	\$4,350/YR	0.6	142.41

<b>GROUP 2</b> In House Low Cost No Cost							
470	Building 470	ECO-E3	10.7	\$265	\$238	0.9	12.14
470	Building 470	ECO-M5	39.3	\$124	\$216	1.7	7.79
	GROUP 2 TOTALS		50.0	\$389	\$454	1.2	8.83

<b>GROUP 3</b> Upgrade HVAC							
48	Building 48	ECO-M7	290.0	\$4,364	\$9,765	2.2	4.10
52	Building 52	ECO-M7	3724.0	\$36,638	\$26,265	0.7	13.64
56	Building 56	ECO-M1	58.0	\$903	\$5,601	6.2	1.47
56	Building 56	ECO-M7	920.0	\$4,068	\$12,169	3.0	4.00
102	Building 102	ECO-M7	863.0	\$4,753	\$10,203	2.1	5.21
136	Building 136	ECO-M7	3914.0	\$23,404	\$30,451	1.3	8.40
345	Building 345	ECO-M7	448.0	\$2,343	\$10,304	4.4	2.58
429	Building 429	ECO-M7	413.0	\$2,204	\$8,528	3.9	2.92
1009	Building 1009	ECO-M7	253.0	\$1,133	\$684	0.6	19.74
	GROUP 3 TOTALS		10883.0	\$79,810	\$113,970	1.4	7.27

<b>GROUP 4</b> Replace Incandescent							
50	Building 50	ECO-E3	7.3	\$113	\$202	1.8	6.57
52	Building 52	ECO-E3	2.7	\$87	\$591	6.8	1.57
77	Building 77	ECO-E3	26.5	\$411	\$1,082	2.6	4.46
102	Building 102	ECO-E3	1.0	\$67	\$72	1.1	4.65
136	Building 136	ECO-E3	12.9	\$268	\$486	1.8	6.15
345	Building 345	ECO-E3	4.2	\$143	\$384	2.7	3.91
	GROUP 4 TOTALS		54.6	\$1,089	\$2,817	2.6	4.35

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 5</b> Insulate Steam Lines							
102	Building 102	ECO-M5	216.3	\$682	\$1,015	1.5	9.10
1009	Building 1009	ECO-M5	78.5	\$248	\$432	1.7	7.77
USDB	USDB Overall	ECO-M5	1479.0	\$4,658	\$10,486	2.3	6.02
GROUP 5 TOTALS			1773.8	\$5,588	\$11,933	2.1	6.35

<b>GROUP 6</b> Reduce Infiltration							
25	Building 25	ECO -A3	224.0	\$1,090	\$5,294	4.9	3.43
25	Building 25	ECO -A5	167.0	\$525	\$6,379	12.2	4.76
77	Building 77	ECO -A3	39.0	\$517	\$5,811	11.2	1.08
345	Building 345	ECO -A3	18.0	\$66	\$314	4.8	3.96
345	Building 345	ECO -A6	60.0	\$206	\$1,004	4.9	4.04
1008	Building 1008	ECO -A3	130.0	\$621	\$4,253	6.8	2.45
1009	Building 1009	ECO -A5	146.0	\$683	\$6,832	10.0	1.70
GROUP 6 TOTALS			784.0	\$3,708	\$29,887	8.1	2.09

<b>GROUP 7</b> Replace Motors							
25	Building 25	ECO-E4	150.1	\$2,327	\$14,793	7.0	1.68
345	Building 345	ECO-E4	18.9	\$293	\$2,680	9.1	1.28
470	Building 470	ECO-E4	26.7	\$414	\$3,469	8.4	1.40
USDB	USDB Overall	ECO-E4	136.0	\$2,108	\$18,206	8.6	1.36
GROUP 7 TOTALS			331.7	\$5,142	\$39,148	7.6	1.54

<b>GROUP 8</b> Building 225							
225	Building 225	ECO-A4	160.0	\$3,926	\$18,784	4.8	2.28
225	Building 225	ECO-M3	346.0	\$1,091	\$11,230	10.3	1.32
GROUP 8 TOTALS			506.0	\$5,017	\$30,014	6.0	2.18



**ENERGY CONSERVATION ANALYSIS**  
**ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	<b>GROUP 9</b> Building 56						
56	Building 56	ECO-A2	243.0	\$1,335	\$17,615	13.2	1.20
56	Building 56	ECO-A3	123.0	\$893	\$5,455	6.1	2.34
56	Building 56	ECO-A4	30.0	\$637	\$5,286	8.3	1.34
56	Building 56	ECO-A6	64.0	\$767	\$7,884	10.3	1.21
56	Building 56	ECO-E3	88.0	\$2,112	\$18,594	8.8	1.24
	GROUP 9 TOTALS		548.0	\$5,744	\$54,834	9.5	1.34

## ENERGY AND COST SAVINGS

### TOTAL POTENTIAL ENERGY AND COST SAVINGS

		ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$/YR
GROUP 1	STEAM TRAP PROGRAM	2,467	\$7,771
GROUP 2	IN HOUSE LOW COST/NO COST	50	\$389
GROUP 3	UPGRADE HVAC	10,883	\$79,810
GROUP 4	REPLACE INCANDESCENT	55	\$1,089
GROUP 5	INSULATE STEAM LINES	1,774	\$5,588
GROUP 6	REDUCE INFILTRATION	784	\$3,708
GROUP 7	REPLACE MOTORS	332	\$5,142
GROUP 8	BUILDING 225	506	\$5,017
GROUP 9	BUILDING 56	548	\$5,744
TOTAL		17,398	\$114,258

### PERCENTAGE OF ENERGY CONSERVED

POTENTIAL ENERGY SAVINGS, MBTU	17,398
EXISTING ENERGY CONSUMPTION, MBTU	83,929
PERCENT ENERGY CONSERVED	20.7%

### ENERGY USE AND COST

	ENERGY MBTU/YR	ENERGY \$/YR
BEFORE ECO IMPLEMENTATION	83,929	\$841,937
AFTER ECO IMPLEMENTATION	66,531	\$727,679

**ENERGY CONSERVATION ANALYSIS**  
**ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 1</b> Steam Trap Program							
STP-B	Service Testing (per 100 traps)	ECO-M8	2467.0	\$7,771	\$4,350/YR	0.6	142.41
	GROUP 1 TOTALS		2467.0	\$7,771	\$4,350/YR	0.6	142.41

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>FEB. 4, 1987</b>	SHEET 0F <b>1 1</b>
<b>PROJECT FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY</b>		<b>BASIS FOR CALCULATION</b>	
LOCATION		<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>		COMPUTED BY <b>MAW</b>	
ECO MEASURE <b>STEAM TRAP PROGRAM - SERVICE TEST</b>		CHECKED BY <b>DEC</b>	

**COST OF STEAM AT FORT LEAVENWORTH**

ENTHALPY OF WATER AT 180°F =	148 BTU/LBM
ENTHALPY OF STEAM AT 100 PSIG =	1,187 BTU/LBM
SYSTEM EFFICIENCY =	60%
NATURAL GAS COST =	\$3.15 MCF
HEAT CONTENT OF NAT. GAS =	<u>1,000,000 BTU/MCF</u>
 ((1,187-148)*\$3.15)/0.6*1,000)	 \$5.45 PER THOUSAND LB STEAM

**COST OF INSPECTING TRAPS USING AND OUTSIDE TESTING SERVICE.**

ASSUMING AN AVERAGE OF 50 TRAPS PER DAY, 8 HOURS PER DAY. THE COST IS A FLAT FEE OF \$20 PER TRAP PLUS THE HOURLY CHARGE.

8 MH	CONTRACT TESTING	=	\$20 PER TRAP
\$320	\$40 PER HOUR	=	\$320 PER DAY
	50 TRAPS PER DAY =		<u>\$6 PER TRAP</u>
TOTAL COST PER TRAP			= \$26 PER TRAP

**SAVINGS FROM TRAP INSPECTION**

USING 100 TRAPS AS A BASE WITH A 10% FAILURE RATE; 350 LB/HR F&T TRAP

COST OF INSPECTING TRAPS ONCE DURING THE HEATING SEASON	100 X \$26 = \$2,600 / YEAR
NUMBER OF TRAPS FAILED	100 X 10% = 10 TRAPS
COST OF REPAIRING TRAPS	10 X \$125 = \$1,250
TOTAL COST FOR TESTING AND REPAIRING TRAPS	<u>= \$3,850</u>

65lbs/hr X 4380 hrs/yr X 0.5(sys. modulation factor) =	142,350 LBS OF STM/ YEAR /TRAP
#of steam X (1187-148) /1,000,000	= 148 MBTU/ YEAR /TRAP
@\$5.45/1000 # steam	= \$776 / YEAR PER TRAP
ENERGY LOST DUE TO FAILED TRAPS	10 X 148 = 1,480 MBTU/ YEAR
COST OF STEAM LOST DUE TO FAILED TRAPS	10 X \$776 = \$7,760 / YEAR

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT LEAVENWORTH

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

STUDY: FTLVGRUP  
LCCID 1.001  
REGION NO. 7

FISCAL YEAR 1987      DISCRETE PORTION NAME: GROUP 1  
ANALYSIS DATE: 06-2-89      ECONOMIC LIFE 15 YEARS      PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	0.
B. SIOH	\$	500.
C. DESIGN COST	\$	0.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	450.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	450.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	0.	\$ 0.	8.59	0.
B. DIST	\$ .00	0.	\$ 0.	11.28	0.
C. RESID	\$ .00	0.	\$ 0.	12.01	0.
D. NAT G	\$ 3.15	2467.	\$ 7771.	12.76	99159.
E. COAL	\$ .00	0.	\$ 0.	10.17	0.
F. TOTAL		2467.	\$ 7771.		\$ 99159.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	-3850.
(1) DISCOUNT FACTOR (TABLE A)	9.11	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	-35074.

B. NON RECURRING SAVINGS (+) / COSTS (-)

ITEM	SAVINGS (+) COST (-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS (+)/ COST (-) (4)
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\*. TOTAL      \$      0      0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)      \$      -35074.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)      \$      32722.  
A IF 3D1 IS = OR > 3C GO TO ITEM 4  
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F=  
C IF 3D1B IS = > 1 GO TO ITEM 4  
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))      \$      3921.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)      \$      64085.

6. DISCOUNTED SAVINGS RATIO      (SIR)=(5 / 1F)=      142.41  
(IF < 1 PROJECT DOES NOT QUALIFY)

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent:

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED

Leaking steam traps are significant source of energy loss. A properly functioning steam trap passes only a small amount of steam through it. If the traps are not functioning properly, steam passes through or escapes from the trap, reducing the efficiency and capacity of the steam system. The boiler operates at a higher capacity than necessary and more make-up water is required to replace the lost steam.

NAME	ORGANIZATION	TELEPHONE NO.	SIGNATURE
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TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT NO YES	ESTIMATED COST	WORK TO BE PERFORMED	FROM
	<input type="checkbox"/> APPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS	FUNDED \$ _____	<input type="checkbox"/> IN-HOUSE	_____ FACILITY
	<input type="checkbox"/> DISAPPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED	WC <u>K</u> \$ <u>3,850</u>	<input type="checkbox"/> SELF-HELP	
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	WC <u>L</u> \$ _____	<input type="checkbox"/> CONTRACT	
			WC _____ \$ _____	<input type="checkbox"/> TROOP	
			UNFUNDED \$ <u>500</u>		
			TOTAL \$ <u>4,350</u>		
APPROVING AUTHORITY _____					

DOCUMENT NUMBER														ACTION TAKEN		DATE				SIGNATURE OF APPROVAL AUTHORITY				FORM	
IS CODE		CHANGE	REQ ID		SERIAL NUMBER				FY	TYPE	MO	DA	DESIG			MO	DA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	A - APPROVED D - DISAPPROVED		15	16	17	18	19	20	21			
X	I	F	I	C										A - APPROVED D - DISAPPROVED					SIGNATURE OF APPROVAL AUTHORITY						

DA FORM 1 AUG 78 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

WHITE  
PINK

①

# WORK REQUEST - XFA, XFB, XFC

-6: the proponent agency is the Office of the Chief of Engineers.

SHORT JOB DESCRIPTION																																																																	BUILDING/FACILITY										BLANK									
																																																																	NUMBER					SUFFIX														
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																											
Steam trap program																																																																																				
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39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																											
DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																																																				
tioning e not ng the er ost steam.															If steam traps are not regularly inspected and fixed, significant amounts of energy will be wasted. Also, the additional make-up water will cause the boiler to corrode quicker and shorten the boiler life. This ECO will save approximately 1,480 million BTU's per year based on a 100 trap system.																																																																					
PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																																				
NAME																																													ORGANIZATION																				TELEPHONE NO.																			

FROM  FACILITIES ENGINEER  DATE		APPROVED FOR DESIGN		SOURCE OF FUNDS																																	
		SIGNATURE		DATE																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="8">FORWARDED TO</th> </tr> <tr> <th colspan="4">DESIGN</th> <th colspan="4">ESTIMATOR</th> </tr> <tr> <th>MO</th><th>DA</th><th>MO</th><th>DA</th><th>MO</th><th>DA</th><th>MO</th><th>DA</th> </tr> <tr> <td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> </table>		FORWARDED TO								DESIGN				ESTIMATOR				MO	DA	MO	DA	MO	DA	MO	DA	19	20	21	22	23	24	25	26	REMARKS			
		FORWARDED TO																																			
DESIGN				ESTIMATOR																																	
MO	DA	MO	DA	MO	DA	MO	DA																														
19	20	21	22	23	24	25	26																														

WHITE (ORIGINAL) - PROJECT FILE COPY  
 PINK - FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK  
 GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 2</b> In House Low Cost No Cost							
470	Building 470	ECO-E3	10.7	\$265	\$238	0.9	12.14
470	Building 470	ECO-M5	39.3	\$124	\$216	1.7	7.79
GROUP 2 TOTALS			50.0	\$389	\$454	1.2	8.83



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET 0F <b>1 1</b>																																							
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD																																								
LOCATION <b>FORT LEAVENWORTH</b>																																										
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>																																										
ECO MEASURE <b>BLDG. #470 E-3 REPLACE INCANDESCENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY																																							
<p><b>ENERGY SAVINGS</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)</td> <td style="width: 10%;"></td> <td style="width: 30%; text-align: right;"><u>1,740.00</u></td> </tr> <tr> <td>MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)</td> <td></td> <td style="text-align: right;"><u>1,748.00</u></td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td>EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)</td> <td></td> <td style="text-align: right;"><u>233,603</u></td> </tr> <tr> <td>MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)</td> <td></td> <td style="text-align: right;"><u>228,123</u></td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td>MBTU'S SAVED PER YR.</td> <td style="text-align: center;"><u>10.70</u></td> <td>MBTU</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="3">           HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  <div style="display: flex; justify-content: space-between; width: 100%;"> <span>-8.00</span> <span>X</span> <span>\$3.15</span> <span>=</span> <span>(\$25)</span> </div> </td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="3">           COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  <div style="display: flex; justify-content: space-between; width: 100%;"> <span>18.70</span> <span>X</span> <span>\$15.50</span> <span>=</span> <span>\$290</span> </div> </td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="2" style="border: 1px solid black; padding: 5px;">ENERGY SAVINGS PER YEAR</td> <td style="border: 1px solid black; text-align: center; padding: 5px;">\$265</td> </tr> </table>				EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)		<u>1,740.00</u>	MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)		<u>1,748.00</u>				EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)		<u>233,603</u>	MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)		<u>228,123</u>				MBTU'S SAVED PER YR.	<u>10.70</u>	MBTU				HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR <div style="display: flex; justify-content: space-between; width: 100%;"> <span>-8.00</span> <span>X</span> <span>\$3.15</span> <span>=</span> <span>(\$25)</span> </div>						COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR <div style="display: flex; justify-content: space-between; width: 100%;"> <span>18.70</span> <span>X</span> <span>\$15.50</span> <span>=</span> <span>\$290</span> </div>						ENERGY SAVINGS PER YEAR		\$265
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ENERGY SAVINGS PER YEAR		\$265																																								

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET 1 OF 1
PROJECT ESOS		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #470 E-3 LIGHTING FIXTURE SUMMARY		COMPUTED BY DLH	CHECKED BY

**SUMMARY OF INCANDESCENT LIGHTING FIXTURES:**

<u>QUANTITY</u>	<u>FIXTURE TYPE &amp; DESCRIPTION</u>
19	[G] -SUSPENDED FIXTURE W/ 1-75W BARE INCANDESCENT LAMP
1	[I] - SUSPENDED FIXTURE W/ 1-120W BARE INCANDESCENT LAMP

REPLACE EXISTING 300 WATT LAMPS IN MECHANICAL ROOMS, RESTROOMS,  
EQUIPMENT ROOMS AND STORAGE ROOMS WITH ABOVE LAMPS.

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>FEB. 10, 1987</b>	SHEET 0F <b>1 1</b>
PROJECT <b>FORT LEAVENWORTH</b> <b>ENERGY SAVINGS OPPORTUNITY SURVEY</b>		BASIS FOR CALCULATION	
LOCATION		<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>INSULATE STEAM LINES</b>		COMPUTED BY <b>MAW</b>	CHECKED BY <b>DEC</b>

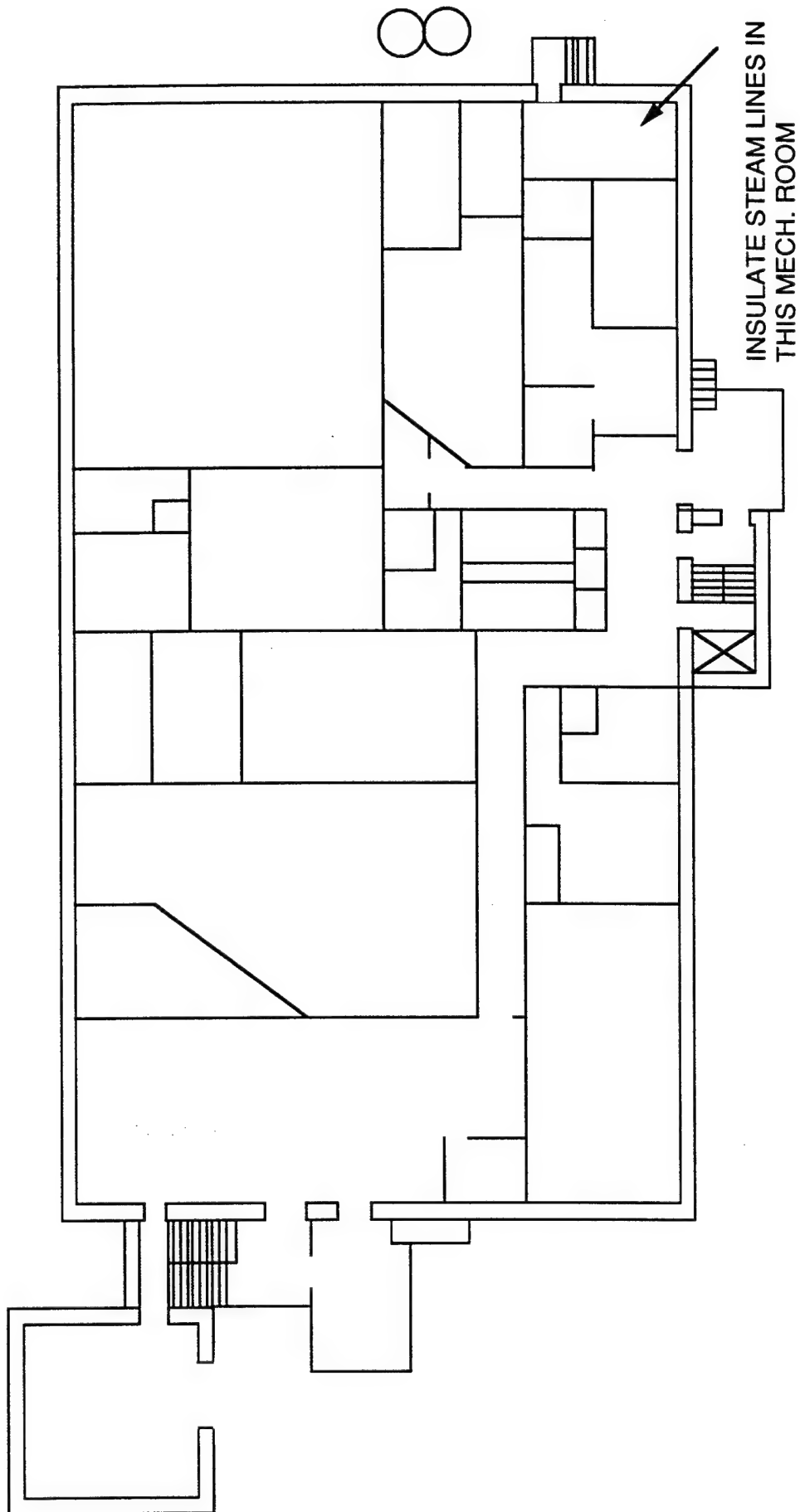
**BUILDING NO. 470**

ALL STEAM LINES ARE INSULATED EXECPT SOME LINES IN THE MECH. ROOM.

15 PSI STEAM

PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL. \$
2"	25	27,482	\$124	\$196

BUILDING TOTAL =      27,482              \$124              \$196



ECO-M5

**BUILDING 470 - FIRST FLOOR**

Not to Scale



LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT LEAVENWORTH      STUDY: FTLVGRUP  
PROJECT NO. & TITLE: DACA41-86-C-0061      FT LEAVENWORTH ESOS      LCCID 1.001      REGION NO. 7

FISCAL YEAR 1987      DISCRETE PORTION NAME: GROUP 2  
ANALYSIS DATE: 07-10-89      ECONOMIC LIFE 15 YEARS      PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	413.
B. SIOH	\$	41.
C. DESIGN COST	\$	21.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	427.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	427.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	19.	\$ 295.	8.59	2530.
B. DIST	\$ .00	0.	\$ 0.	11.28	0.
C. RESID	\$ .00	0.	\$ 0.	12.01	0.
D. NAT G	\$ 3.15	31.	\$ 98.	12.76	1246.
E. COAL	\$ .00	0.	\$ 0.	10.17	0.
F. TOTAL		50.	\$ 392.		\$ 3776.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	9.11	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	1246.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	392.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	3776.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	8.83	
(IF < 1 PROJECT DOES NOT QUALIFY)		

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent age

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED

REQUESTER INFORMATION

FORWARD FOR APPROVAL

### APPROVAL ACTION

DA FORM 1 AUG 78 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED

WHITE (OF  
PINK



WORK REQUEST - XFA, XFB, XFC  
n 420-6: the proponent agency is the Office of the Chief of Engineers.

N	SHORT JOB DESCRIPTION																																																								BUILDING/FACILITY								BLANK														
																																																									NUMBER				SUFFIX																		
7	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																				
Building 4710 improvements																																																																															
CILITY		BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BLANK																																					
SUFFIX		NUMBER					SUFFIX					NUMBER					SUFFIX					NUMBER					SUFFIX					NUMBER					SUFFIX																																										
7	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																				

ities: to damaged or scape lines are e burns. fluorescent	DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																																														
	If the lines remain uninsulated, steam energy will continue to be wasted and the pipes will continue to be a safety hazard. High wattage incandescent lights are a very inefficient use of energy dollars. This ECO would save approximately 50 million BTU's per year.																																																																														
PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																															
NAME																																								ORGANIZATION																				TELEPHONE NO.																			

O BE MED	FROM				
	FACILITIES ENGINEER				
OUSE -HELP RACT P	DATE				
APPROVED FOR DESIGN		SOURCE OF FUNDS			
SIGNATURE		DATE		<input type="checkbox"/> DIRECT	
				<input type="checkbox"/> AUTOMATIC REIMB.	
REMARKS				<input type="checkbox"/> FUNDED REIMB.	
FORWARDED TO					
DESIGN		ESTIMATOR			
MO DA		MO DA			
19 20 21 22 23 24 25 26					
THORITY					

WHITE (ORIGINAL) - PROJECT FILE COPY  
PINK - FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK  
GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 3 Upgrade HVAC</b>							
48	Building 48	ECO-M7	290.0	\$4,364	\$9,765	2.2	4.10
52	Building 52	ECO-M7	3724.0	\$36,638	\$26,265	0.7	13.64
56	Building 56	ECO-M1	58.0	\$903	\$5,601	6.2	1.47
56	Building 56	ECO-M7	920.0	\$4,068	\$12,169	3.0	4.00
102	Building 102	ECO-M7	863.0	\$4,753	\$10,203	2.1	5.21
136	Building 136	ECO-M7	3914.0	\$23,404	\$30,451	1.3	8.40
345	Building 345	ECO-M7	448.0	\$2,343	\$10,304	4.4	2.58
429	Building 429	ECO-M7	413.0	\$2,204	\$8,528	3.9	2.92
1009	Building 1009	ECO-M7	253.0	\$1,133	\$684	0.6	19.74
GROUP 3 TOTALS			10883.0	\$79,810	\$113,970	1.4	7.27



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #48 M7 UPGRADE HVAC CONTROLS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>1,453.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>1,442.00</u>

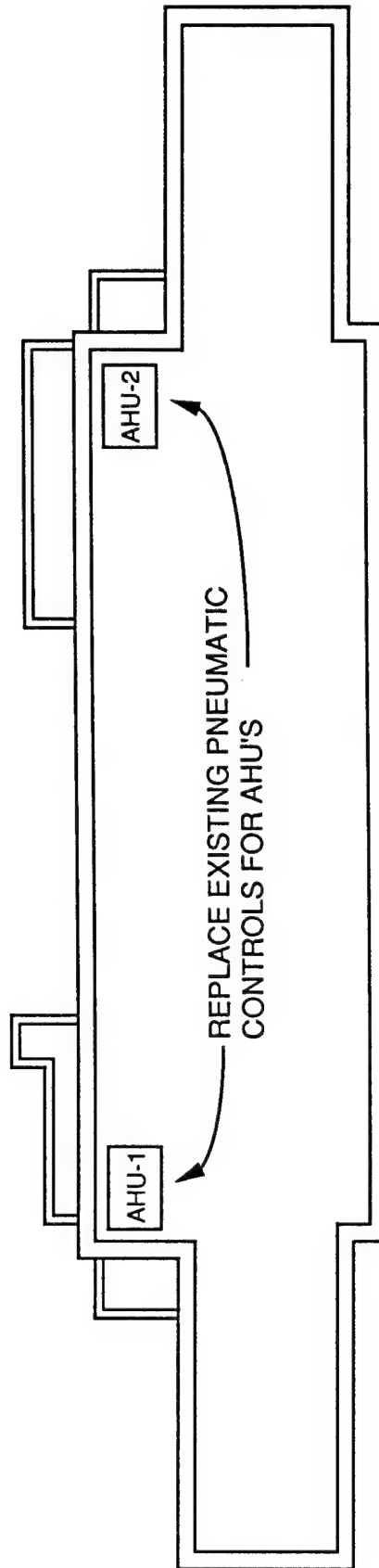
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>327,946.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>246,114.00</u>

MBTU'S SAVED PER YR. 290.29 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 11.00 X \$3.15 = \$35

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 279.29 X \$15.50 = \$4,329

ENERGY SAVINGS PER YEAR	\$4,364
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #52 M7 UPGRADE HVAC CONTROLS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>5,926.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>4,219.00</u>
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>1,430,708.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>839,769.00</u>

MBTU'S SAVED PER YR. 3,723.87 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

1,707.00	X	\$3.15	=	\$5,377
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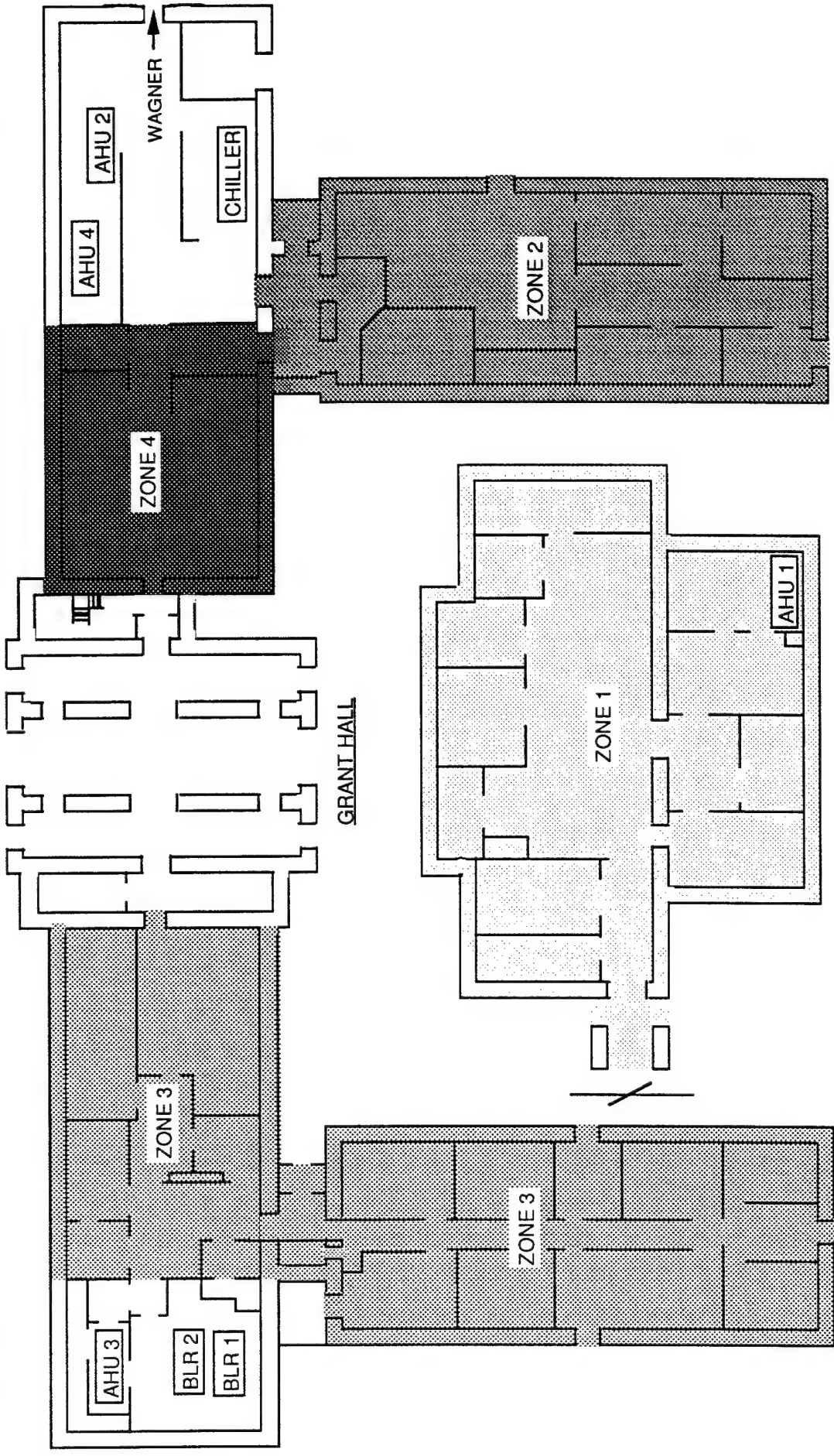
  

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

2,016.87	X	\$15.50	=	\$31,261
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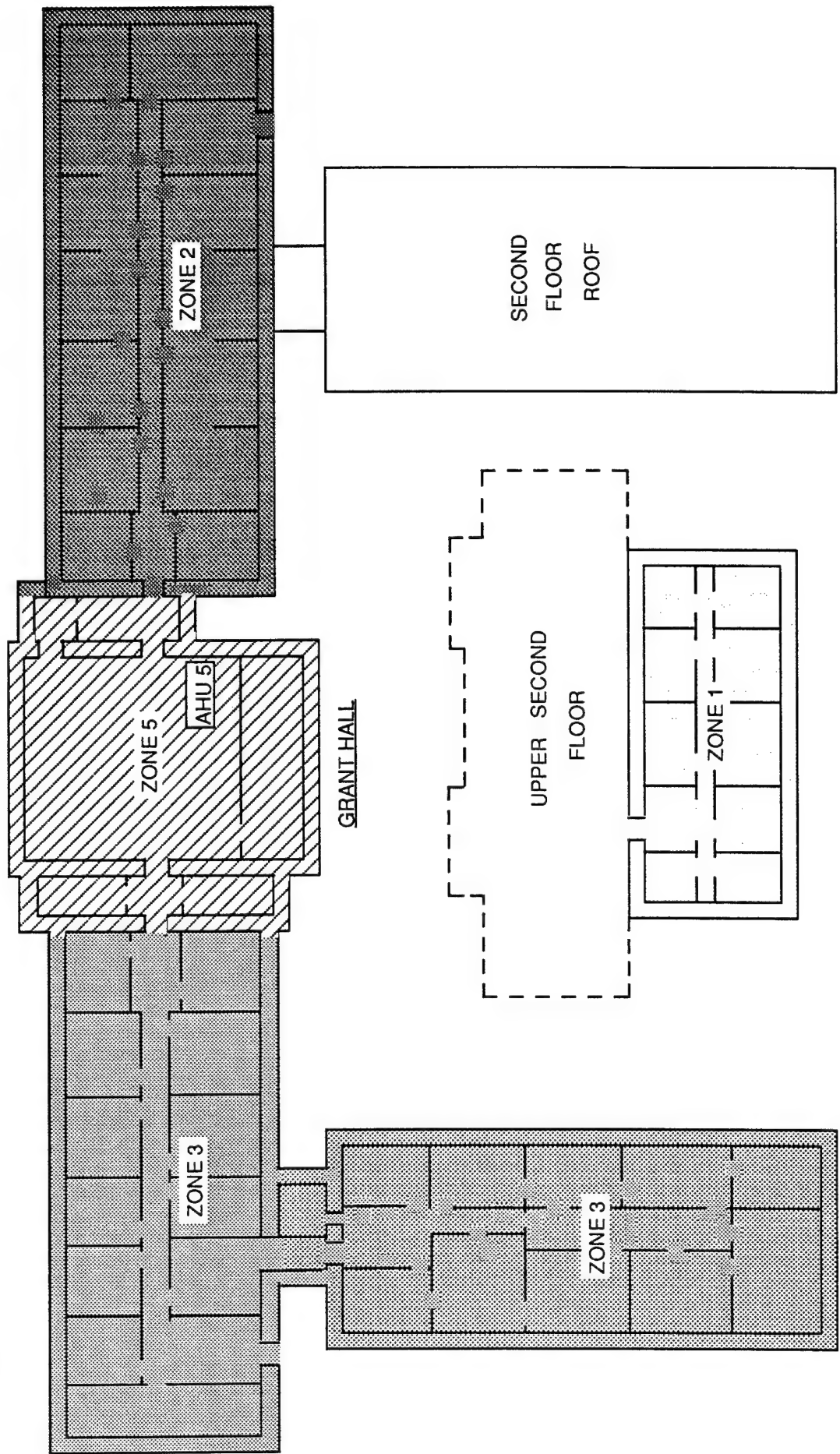
ENERGY SAVINGS PER YEAR	\$36,638
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**ZONE MAP FOR**

**BUILDING 52 - BASEMENT FLOOR - (ZONES 1, 2, 3 & 4)**

**ECO -M7**



SHERMAN HALL

WAGNER HALL

SHERIDAN HALL

ECO - M7



ZONE MAP FOR

BUILDING 52 - THIRD FLOOR - (ZONES 1, 2, 3 & 5)

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #56 M1 DRY BULB ECONOMIZER</b>		COMPUTED BY <b>MAW</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>417,025.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>399,948.00</u>

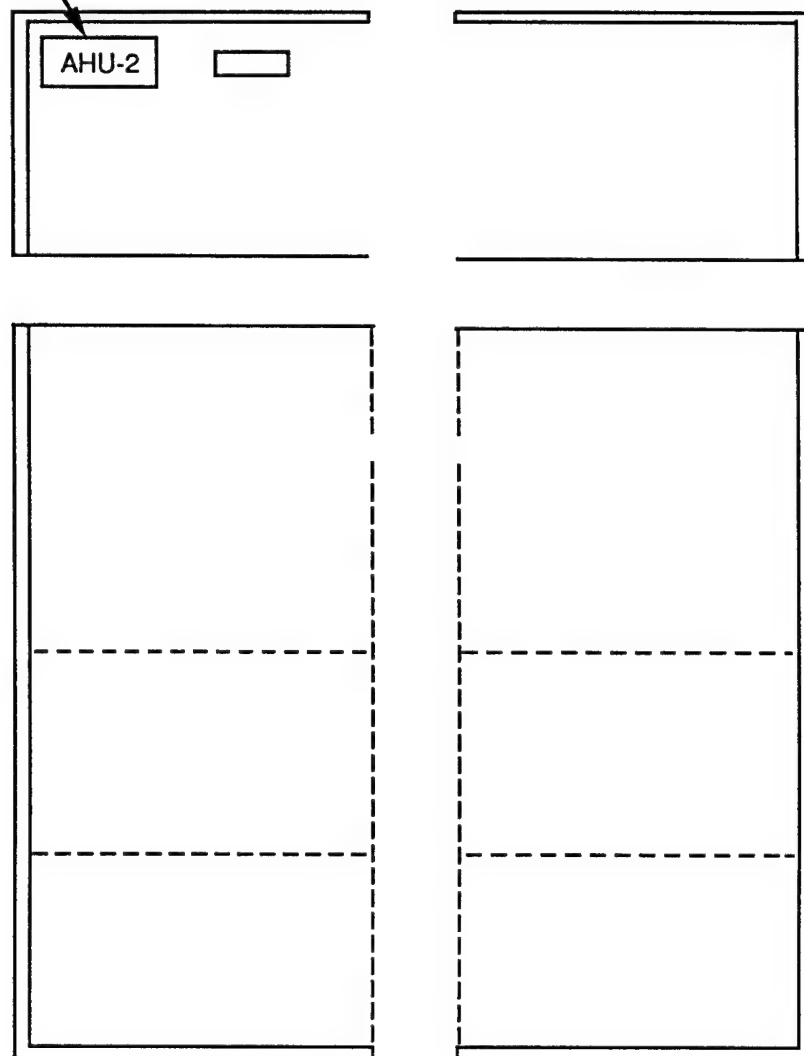
MBTU'S SAVED PER YR. 58.28 MBTU

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

58.28 X \$15.50 = \$903

ENERGY SAVINGS PER YEAR	\$903
-------------------------	-------

INSTALL  
ECONOMIZER  
ON AHU-2



**BUILDING 56 - Assembly Room**

Not to Scale

ECO-M1

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 6/1/87	SHEET OF 1 1
PROJECT ESOS		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #56 M7 UPGRADE HVAC CONTROLS		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 3,992.00  
 MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 3,167.00

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.) 444,791.00  
 MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.) 417,025.00

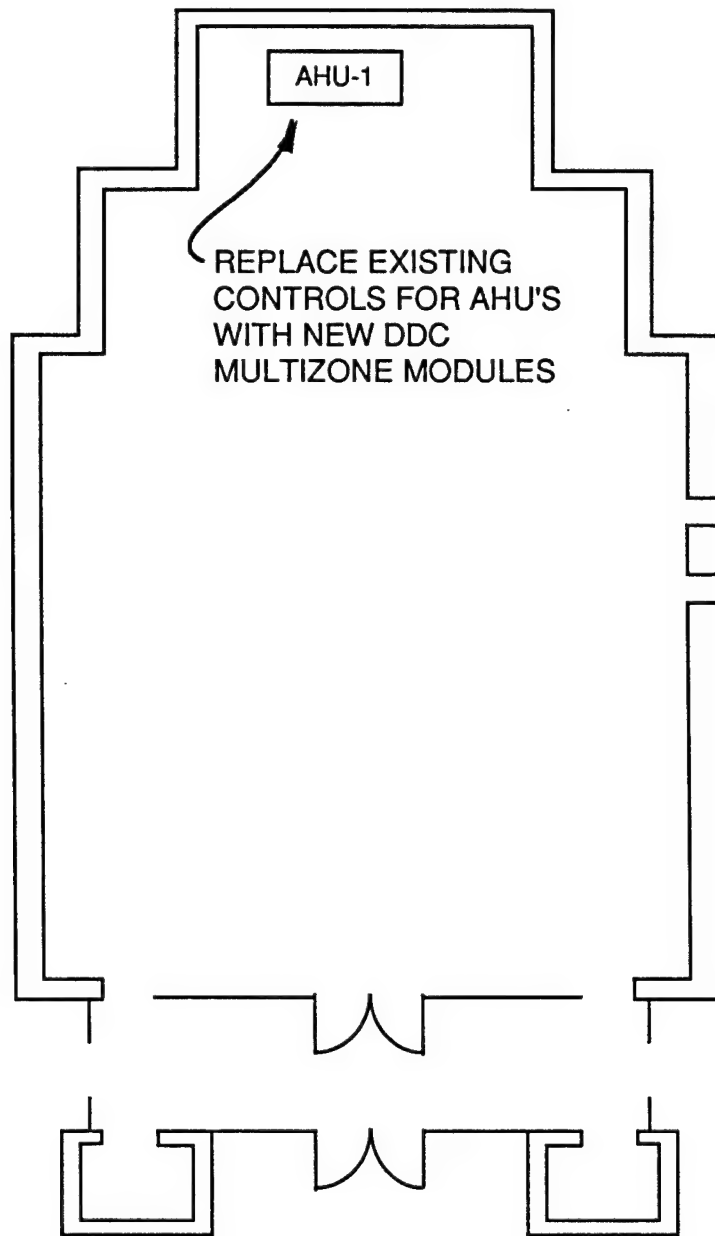
MBTU'S SAVED PER YR. 919.77 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 825.00 X \$3.15 = \$2,599

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 94.77 X \$15.50 = \$1,469

ENERGY SAVINGS PER YEAR	\$4,068
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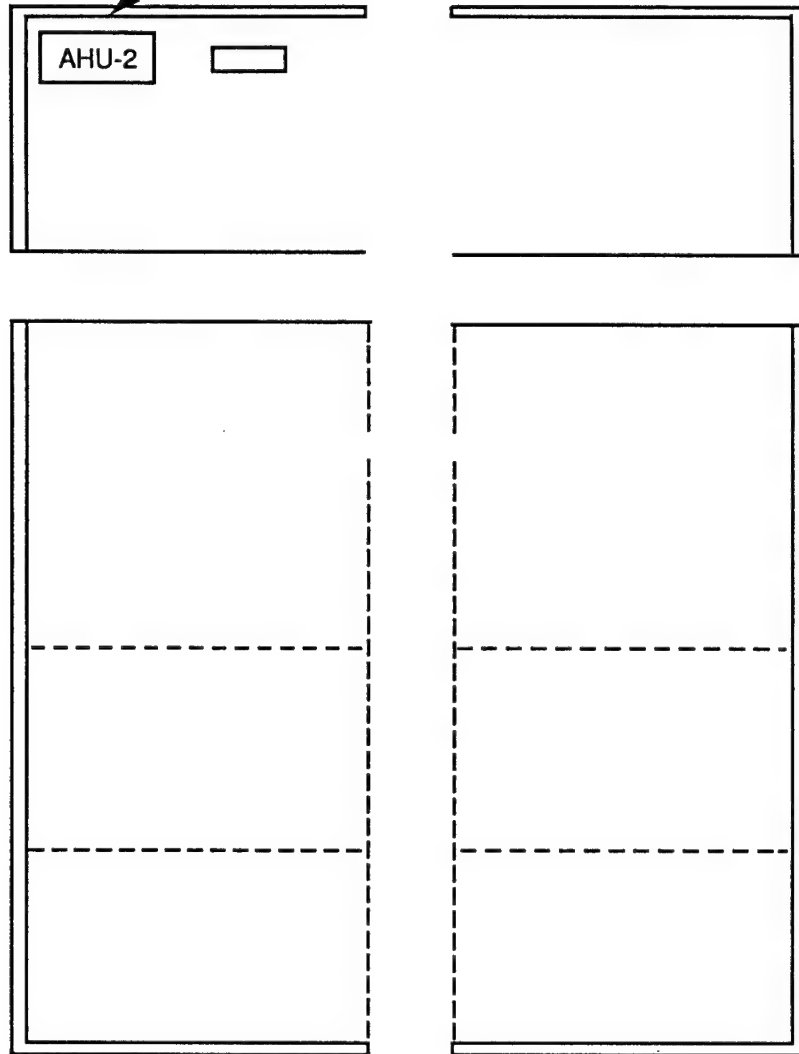


**BUILDING 56 - CHAPEL**

Not to Scale

ECO-M7

REPLACE EXISTING CONTROLS  
FOR AHU'S WITH NEW DDC  
MULTIZONE MODULES



**BUILDING 56 - Assembly Room**

ECO-M7

Not to Scale

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 6/1/87	SHEET 0F 1 1
PROJECT ESOS		BASIS FOR CALCULATION  HAND CALCULATIONS _____ COMPUTER CALCULATIONS _____ CONTRACTOR BID X _____ OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #102 M7 UPGRADE HVAC CONTROLS		COMPUTED BY DLH	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	1,648.00
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	950.00

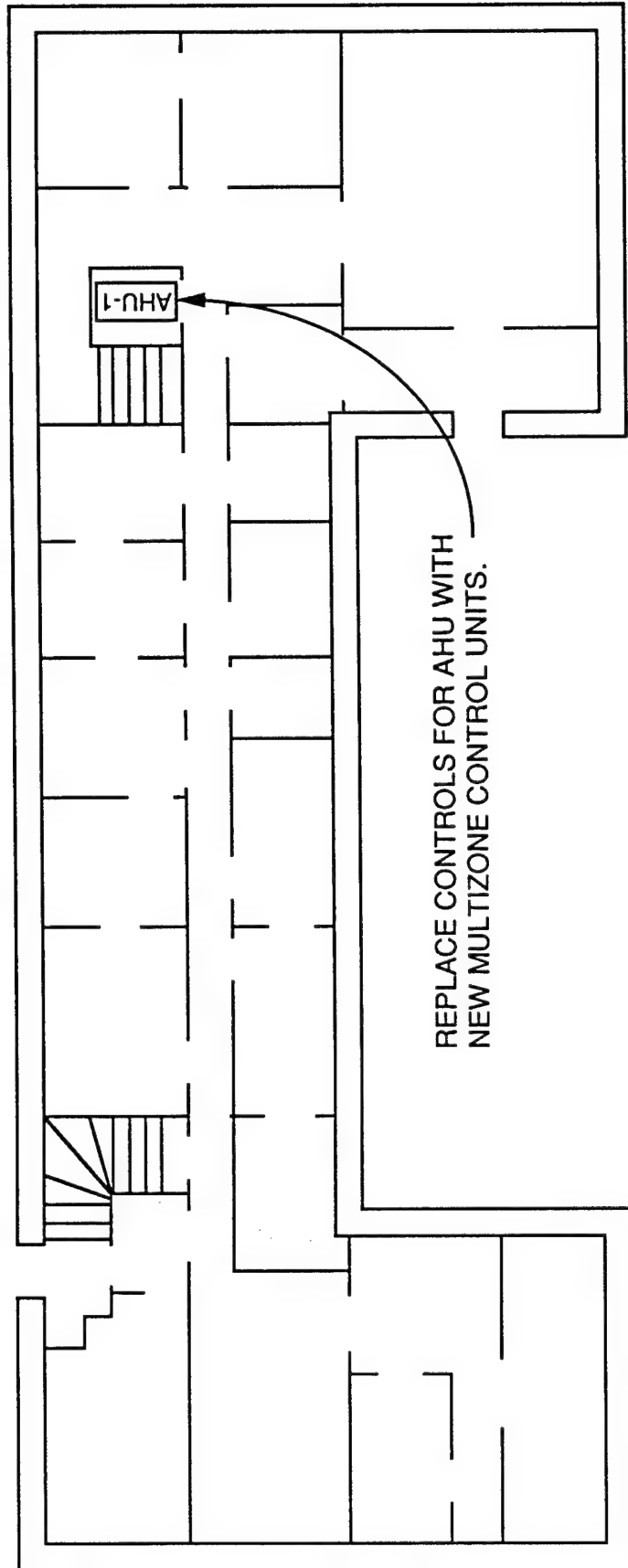
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	184,359.00
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	136,082.00

MBTU'S SAVED PER YR. 862.77 MBTU

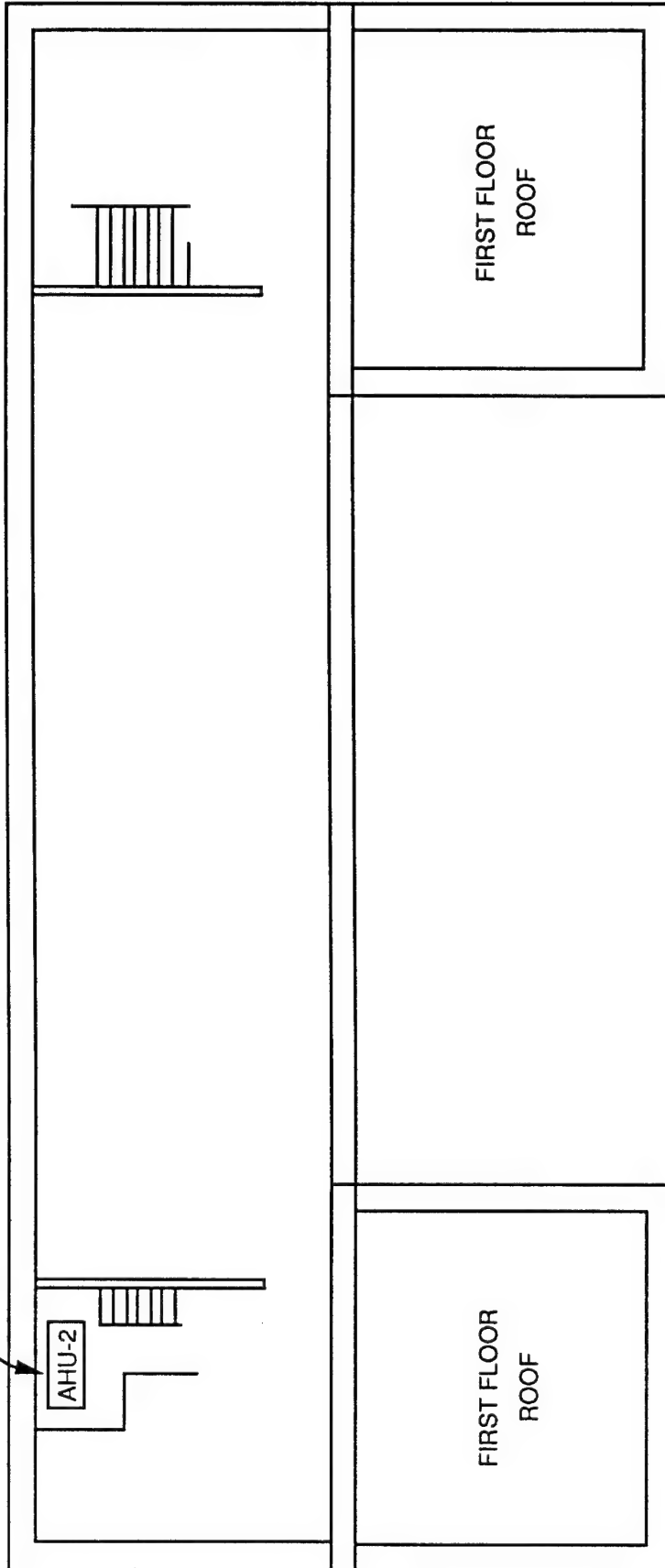
HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 698.00 X \$3.15 = \$2,199

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 164.77 X \$15.50 = \$2,554

ENERGY SAVINGS PER YEAR	\$4,753
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REPLACE CONTROLS FOR AHU WITH  
NEW MULTIZONE CONTROL UNITS.



**BUILDING 102 - SECOND FLOOR**  
Not to Scale

ECO-M7

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 6/1/87	SHEET OF 1 1
PROJECT ESOS		BASIS FOR CALCULATION  HAND CALCULATIONS COMPUTER CALCULATIONS CONTRACTOR BID X OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #136 M7 UPGRADE HVAC CONTROLS		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	5,420.00
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	2,403.00

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	5,442,469.00
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	5,179,720.00

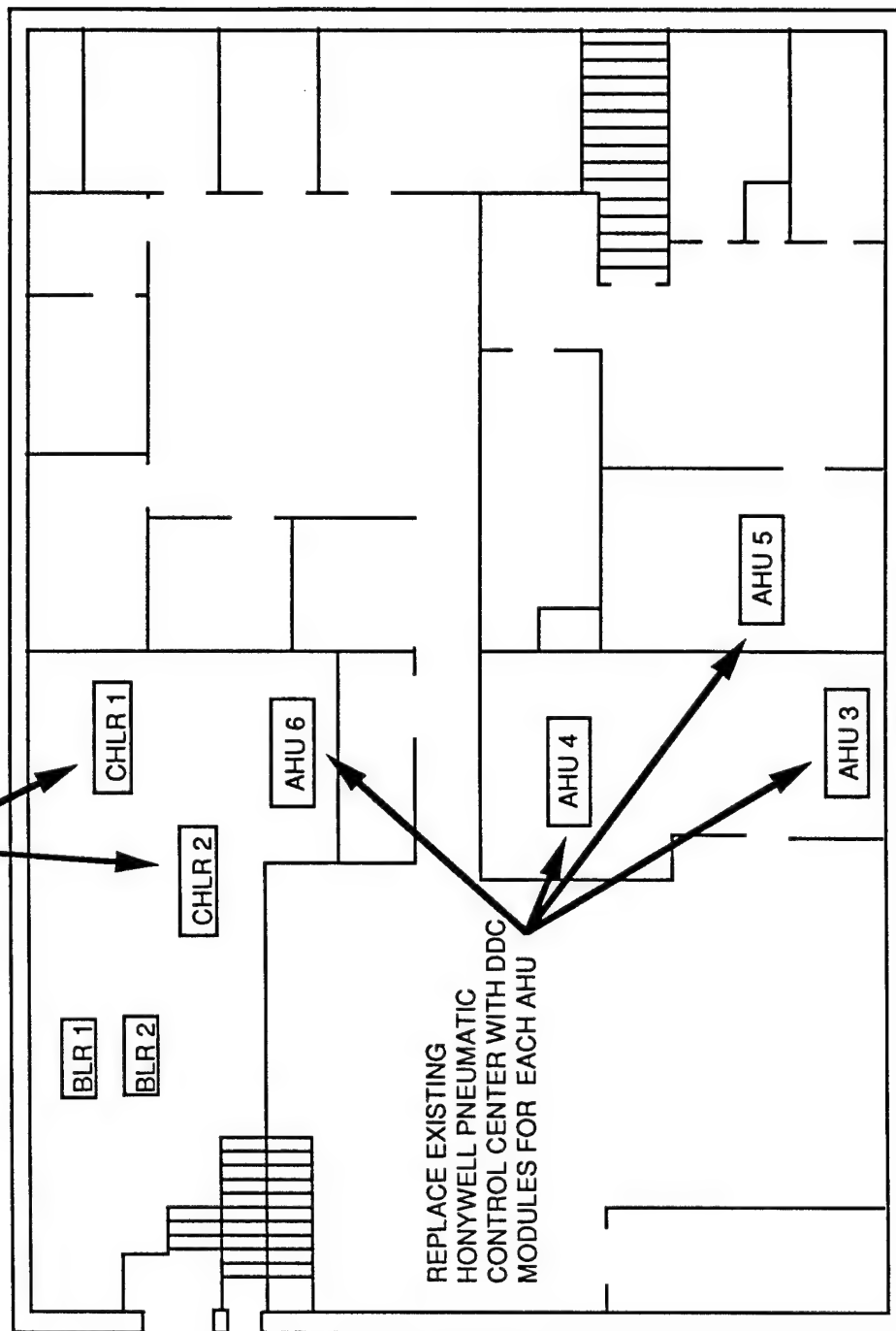
MBTU'S SAVED PER YR. 3,913.76 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 3,017.00 X \$3.15 = \$9,504

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 896.76 X \$15.50 = \$13,900

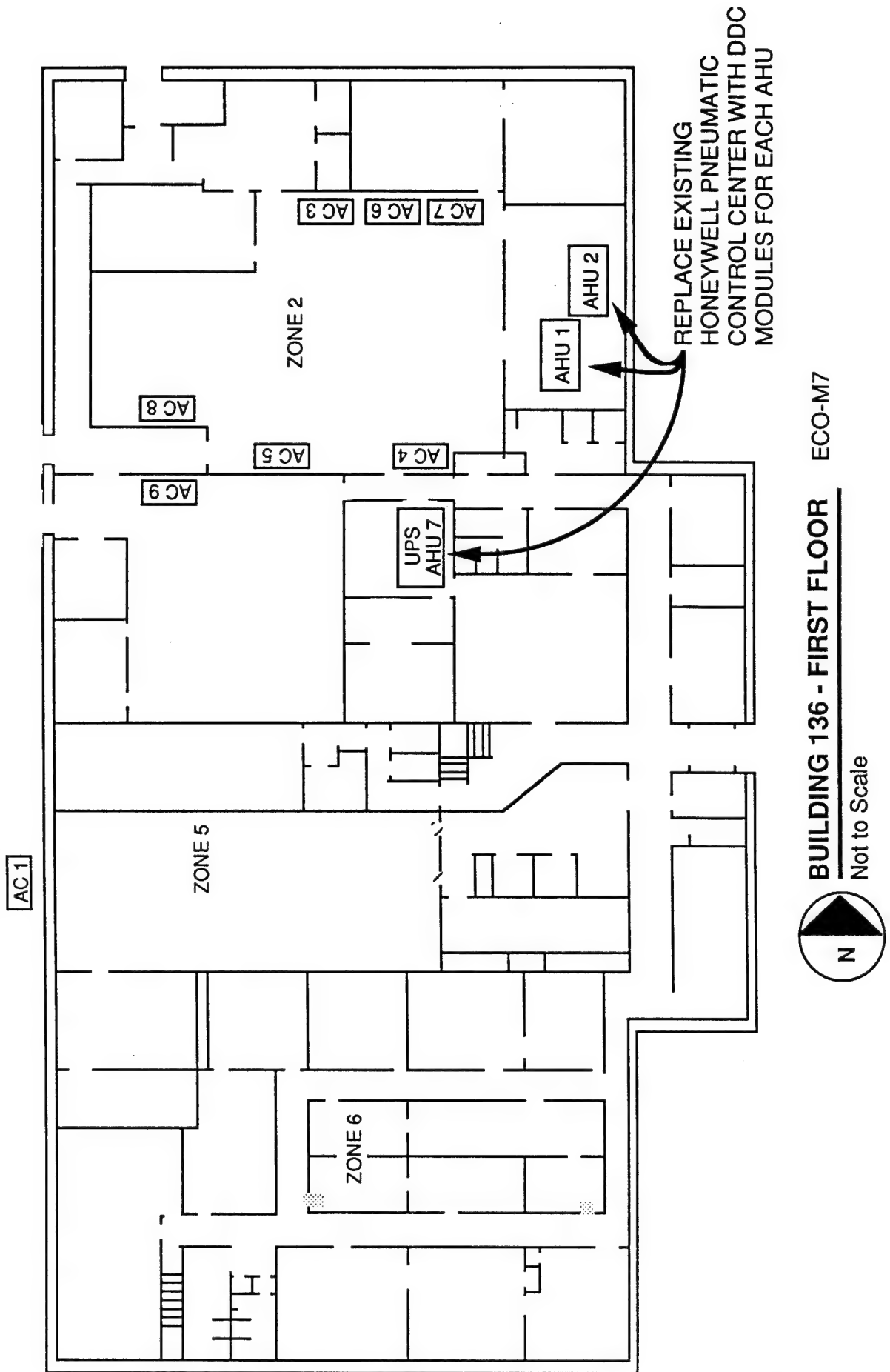
ENERGY SAVINGS PER YEAR	\$23,404
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REPLACE ONE OF THE TWO CHILLERS WITH  
NEW CHILLER, SIZED TO CURRENT LOAD



**BUILDING 136 - BASEMENT FLOOR** ECO-M7

Not to Scale



**BUILDING 136 - FIRST FLOOR** ECO-M7



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #345 M7 UPGRADE HVAC CONTROLS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,300.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,927.00</u>

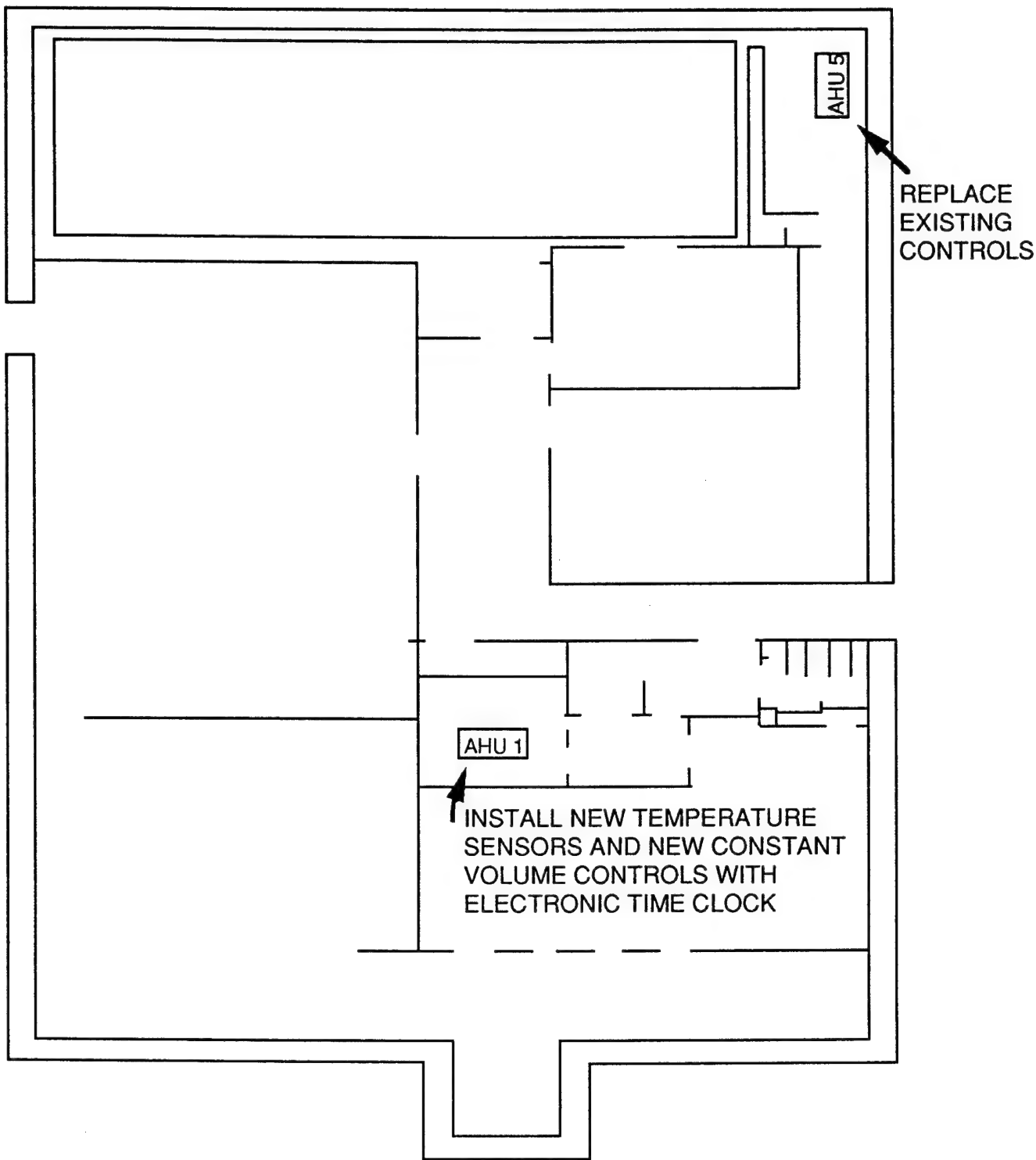
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>138,427.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>116,342.00</u>

MBTU'S SAVED PER YR. 448.38 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 373.00 X \$3.15 = \$1,175

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 75.38 X \$15.50 = \$1,168

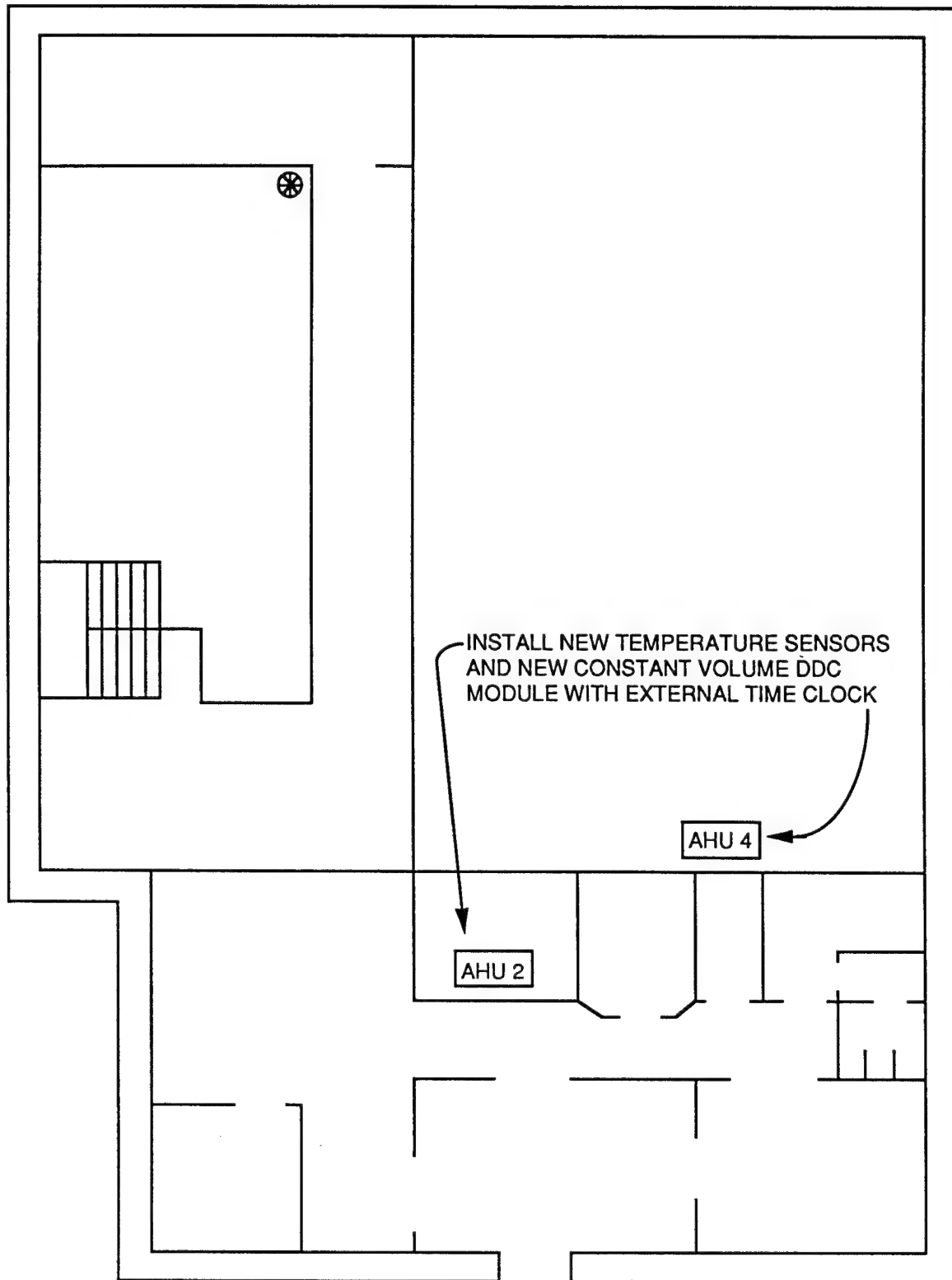
ENERGY SAVINGS PER YEAR	<b>\$2,343</b>
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**BUILDING 345 - BASEMENT**

Not to Scale

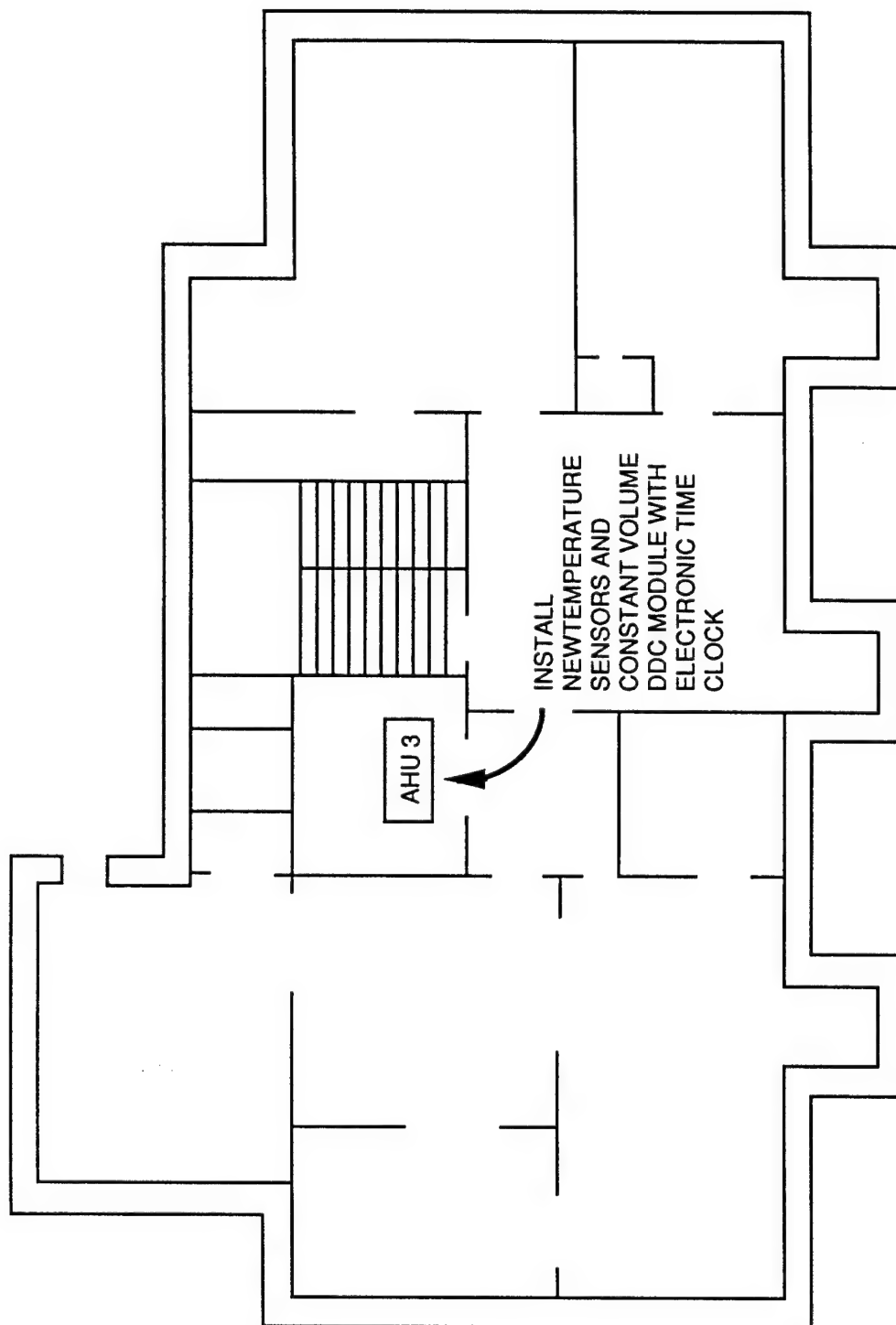
ECO-M7



**BUILDING 345 - SECOND FLOOR**

ECO -M7

Not to Scale



**BUILDING 345 - THIRD FLOOR**

Not to Scale

ECO-M7

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #429 M7 UPGRADE HVAC CONTROLS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,931.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,591.00</u>
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>330,100.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>308,680.00</u>

MBTU'S SAVED PER YR. 413.11 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

340.00	X	\$3.15	=	\$1,071
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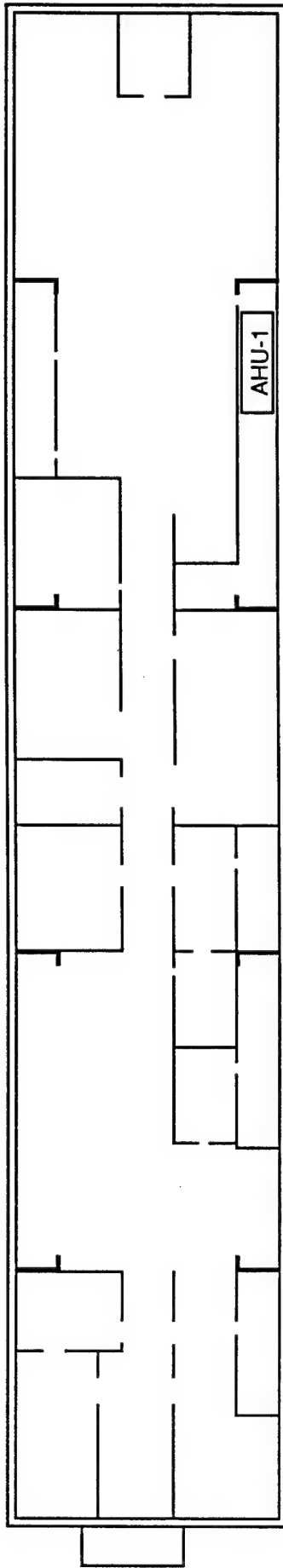
  

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

73.11	X	\$15.50	=	\$1,133
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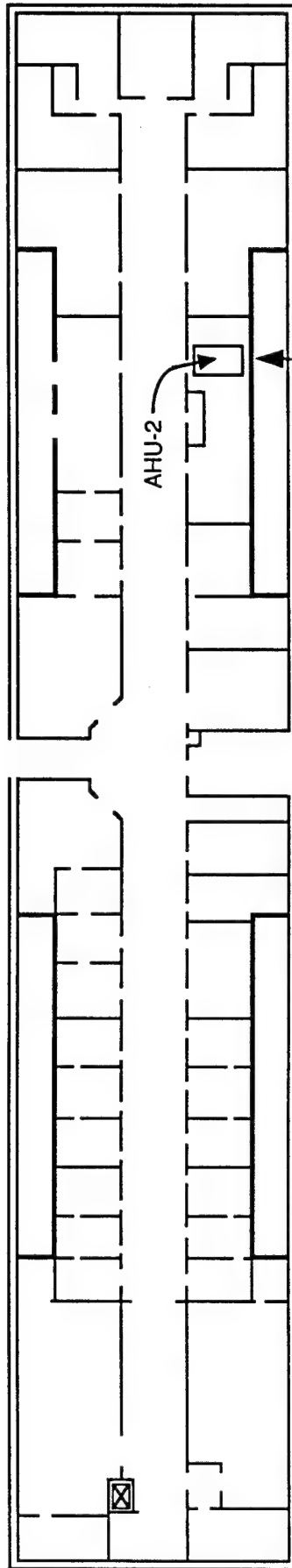
ENERGY SAVINGS PER YEAR	\$2,204
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REPLACE CONTROLS FOR AHU  
WITH DDC CONTROL MODULES



**BUILDING 429 - BASEMENT LEVEL** ECO-M7  
Not to Scale



REPLACE CONTROLS FOR AHU  
WITH DDC CONTROL MODULES



**BUILDING 429 - FIRST FLOOR** ECO - M7  
Not to Scale

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>6/1/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #1009 M7 UPGRADE HVAC CONTROLS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 659.00  
 MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 523.00

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 212.00  
 MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 185.00

MBTU'S SAVED PER YR. 163.00 MBTU

HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR

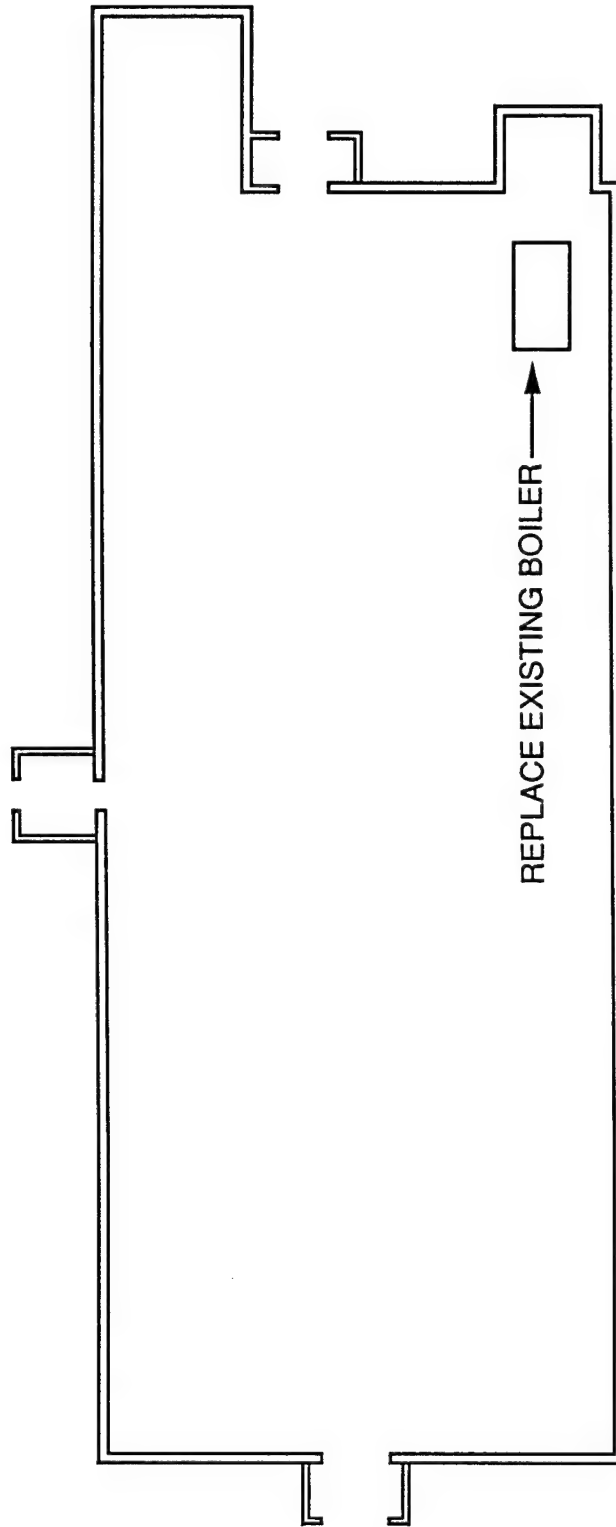
136 / 60% = 226.67

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 226.67 X \$3.15 = \$714

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 27.00 X \$15.50 = \$419

ENERGY SAVINGS PER YEAR	\$1,133
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 **BUILDING 1009**  
Not to Scale  
ECO-M7

LIFE CYCLE COST ANALYSIS SUMMARY  
 ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)  
 INSTALLATION & LOCATION: FT LEAVENWORTH  
 PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

STUDY: FTLVGRUP  
 LCCID 1.001  
 REGION NO. 7

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP 3

ANALYSIS DATE: 07-10-89

ECONOMIC LIFE 15 YEARS

PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	103610.
B. SIOH	\$	10361.
C. DESIGN COST	\$	5181.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	107236.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	107236.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	3686.	\$ 57139.	8.59	490826.
B. DIST	\$ .00	0.	\$ 0.	11.28	0.
C. RESID	\$ .00	0.	\$ 0.	12.01	0.
D. NAT G	\$ 3.15	7197.	\$ 22671.	12.76	289276.
E. COAL	\$ .00	0.	\$ 0.	10.17	0.
F. TOTAL		10883.	\$ 79810.		\$ 780102.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	9.11	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	257434.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F=		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	79810.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	780102.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	7.27	
(IF < 1 PROJECT DOES NOT QUALIFY)		

For use of this form, see AR 420-17 and DA Pam 420-6; the proo:

**DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED**

REQUESTER INFORMATION

FORWARD FOR APPROVAL

### APPROVAL ACTION

DA FORM 1 AUG 78 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

WH:  
PIN

0

## 3 WORK REQUEST - XFA, XFB, XFC

3-6: the proponent agency is the Office of the Chief of Engineers.

SHORT JOB DESCRIPTION																																																												BUILDING/FACILITY										BLANK									
																																																												NUMBER										SUFFIX									
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																						
Repair/replace HVAC controls																																																																															
BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BLANK																																							
NUMBER										SUFFIX										NUMBER										SUFFIX										NUMBER										SUFFIX																													
39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																						
P10110121A										P101014181A										P10142191A										P111010191A																																																	
DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																																															
The controls Most ain. enance.																				The buildings will continue to waste energy by allowing wide temperature swings and uneven temperature control. This causes building occupants to register complaints, or to try to fix the problem themselves which will waste even more energy. Opening a window to correct an overheating problem (which is a common solution) is an extreme waste of energy and money. This ECO would save approximately 10,883 million BTU's per year.																																																											
PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																															
NAME																																								ORGANIZATION																				TELEPHONE NO.																			

FROM		APPROVED FOR DESIGN		SOURCE OF FUNDS	
FACILITIES ENGINEER				<input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.	
DATE		SIGNATURE		DATE	
		REMARKS			
-FORWARDED TO DESIGN ESTIMATOR MO DA MO DA 19 20 21 22 23 24 25 26					
RITY					

WHITE (ORIGINAL) - PROJECT FILE COPY  
PINK- FORWARD TO KEYPUNCH AFTER COMPLETION  
OF "APPROVAL ACTION" BLOCKGREEN - FORWARD TO KEYPUNCH AFTER  
COMPLETION OF "FORWARD FOR  
APPROVAL" BLOCK

②

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 4</b> Replace Incandescent							
50	Building 50	ECO-E3	7.3	\$113	\$202	1.8	6.57
52	Building 52	ECO-E3	2.7	\$87	\$591	6.8	1.57
77	Building 77	ECO-E3	26.5	\$411	\$1,082	2.6	4.46
102	Building 102	ECO-E3	1.0	\$67	\$72	1.1	4.65
136	Building 136	ECO-E3	12.9	\$268	\$486	1.8	6.15
345	Building 345	ECO-E3	4.2	\$143	\$384	2.7	3.91
GROUP 4 TOTALS			54.6	\$1,089	\$2,817	2.6	4.35

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

**BUILDING #50          1703 TOTAL WATTS REDUCTION**

RECIEVING DOCK - CHANGE 2 LAMPS FROM 100W TO 90W

STORAGE AREA - CHANGE 1 LAMP FROM 70W TO 57W

LOUNGE AREA - CHANGE 2 LAMPS FROM 100W TO 90W

BSMT STORAGE - CHANGE 4 LAMPS FROM 200W TO 90W

MECHANICAL RM - CHANGE 11 LAMPS FROM 200W TO 90W

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> <b>X</b> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #50 E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING LIGHTING USAGE 42,230 WATTS  
 INCANDESCENT REPLACEMENT BUILDING LIGHTING USAGE 40,527 WATTS

WATTS SAVED 1,703 WATTS

HRS. PER DAY X DAYS PER WEEK X WEEKS PER YEAR LESS HOLIDAYS = HRS. USED PER YEAR

5 X 5 X 52 -2 = 1,250  
 TOTAL = 1,250 HR.

HRS. USED PER YEAR X WATTS SAVED = KWH SAVED PER YEAR  
 1,250 X 1,703 = 2,129

KWH SAVED PER YEAR X WATTS PER MBTU = MBTU SAVED PER YEAR  
 2,129 X 3.41E-03 = 7.3

MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 7.3 X \$15.50 = \$113

ENERGY COST SAVINGS PER YEAR	\$113
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>
<p>BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS</p> <p><b>BUILDING #52                      1220 TOTAL WATTS REDUCTION</b></p> <p><u>GRANT HALL</u>                      1150 WATTS REDUCTION</p> <p>OFFICE 246 - CHANGE 1 LAMP FROM 100W TO 90W.</p> <p>AUDITORIUM 317 - CHANGE 36 LAMPS FROM 150W TO 120W</p> <p>CORRIDOR 318 - CHANGE 1 LAMPS FROM 100W TO 90W</p> <p>PROJECTION ROOM- CHANGE 5 LAMPS FROM 100W TO 90W.</p> <p><u>SHERIDAN HALL</u>                      40 WATTS REDUCTION</p> <p>CORRIDOR 150- CHANGE 4 LAMPS FROM 100W TO 90W.</p> <p><u>SHERMAN HALL</u>                      30 WATTS REDUCTION</p> <p>ENTRY 119A - CHANGE 1 LAMPS FROM 100W TO 90W</p> <p>OFFICE 125B - CHANGE 1 LAMPS FROM 100W TO 90W</p> <p>ENTRY 125B - CHANGE 1 LAMPS FROM 100W TO 90W</p>			



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET 0F <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  X      HAND CALCULATIONS COMPUTER CALCULATIONS CONTRACTOR BID OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #52 E-3 REPLACE INCANDESCENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	4,219.62
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	4,223.35
EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	839,769
MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	837,893

MBTU'S SAVED PER YR.      2.67 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

-3.73	X	\$3.15	=	(\$12)
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ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

6.40	X	\$15.50	=	\$99
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ENERGY SAVINGS PER YEAR	\$87
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

**BUILDING #77          2985 TOTAL WATTS REDUCTION**

150 PAPER STORAGE - CHANGE 54 -150W LAMPS TO 120W.	
150 PAPER STORAGE - CHANGE 26 -100W LAMPS TO 75W.	2270 W
126 CONF. ROOM - CHANGE 5 -75W LAMPS TO 50W.	125 W
ELEVATOR ROOM - CHANGE 3 -300W LAMPS TO 120W.	540 W
MECHANICAL ROOM - CHANGE 2 - 100W LAMPS TO 75W.	50

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF 1 1
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #77 E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING LIGHTING USAGE 131,115 WATTS  
 INCANDESCENT REPLACEMENT BUILDING LIGHTING USAGE 128,130 WATTS

WATTS SAVED 2,985 WATTS

HRS. PER DAY X DAYS PER WEEK X WEEKS PER YEAR LESS HOLIDAYS = HRS. USED PER YEAR

8	X	5	X	52 -2	=	2,000
6	X	2	X	52 -2	=	600
TOTAL					=	2,600 HR.

HRS. USED PER YEAR X WATTS SAVED = KWH SAVED PER YEAR

2,600	X	2,985	=	7,761
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KWH SAVED PER YEAR X WATTS PER MBTU = MBTU SAVED PER YEAR

7,761	X	3.41E-03	=	26.5
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MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

26.5	X	\$15.50	=	\$411
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ENERGY COST SAVINGS PER YEAR	\$411
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET 0F <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>
<p>BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS</p> <p><b>BUILDING #102      170 TOTAL WATTS REDUCTION</b></p> <p>TOILETS- CHANGE 3 -100W LAMPS TO 90W. <span style="float: right;">30 W</span></p> <p>MECHANICAL ROOM - CHANGE 1 - 150W LAMP TO 90W. <span style="float: right;">60 W</span></p> <p>LOUNGE - CHANGE 2 -100W LAMPS TO 90W. <span style="float: right;">20 W</span></p> <p>PORCH - CHANGE 1 - 150W LAMP TO 90W. <span style="float: right;">60 W</span></p>			

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  X      HAND CALCULATIONS COMPUTER CALCULATIONS CONTRACTOR BID OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #102 E-3 REPLACE INCANDESCENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

**ENERGY SAVINGS**

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>950.04</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>953.69</u>
EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>136,083</u>
MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>134,593</u>

MBTU'S SAVED PER YR.      1.44 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

-3.65	X	\$3.15	=	(\$11)
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ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

5.09	X	\$15.50	=	\$79
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ENERGY SAVINGS PER YEAR	\$67
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET OF <b>1 1</b>																		
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD																			
LOCATION <b>FORT LEAVENWORTH</b>																					
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>																					
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>																		
<p>BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS</p> <p><b>BUILDING #136            900 TOTAL WATTS REDUCTION</b></p> <table> <tr> <td>TOILETS - CHANGE 24 -100W LAMPS TO 90W.</td> <td>240 W</td> </tr> <tr> <td>CORRIDORS - CHANGE 9 -100W LAMPS TO 90W</td> <td>90 W</td> </tr> <tr> <td>STAIRS - CHANGE 4 -100W LAMPS TO 90W</td> <td>40 W</td> </tr> <tr> <td>JANITOR - CHANGE 1 -100W LAMP TO 90W</td> <td>10 W</td> </tr> <tr> <td>JANITOR - CHANGE 1 -300W LAMP TO 150W</td> <td>150 W</td> </tr> <tr> <td>EQUIP. RM 208 - CHANGE 2-300W LAMPS TO 150W.</td> <td>300 W</td> </tr> <tr> <td>EQUIP. RM 209 - CHANGE 4-100W LAMPS TO 90W.</td> <td>40 W</td> </tr> <tr> <td>ENTRY - CHANGE 2-100W LAMPS TO 90W.</td> <td>20 W</td> </tr> <tr> <td>KITCHEN - CHANGE 1-100W LAMP TO 90W.</td> <td>10 W</td> </tr> </table>				TOILETS - CHANGE 24 -100W LAMPS TO 90W.	240 W	CORRIDORS - CHANGE 9 -100W LAMPS TO 90W	90 W	STAIRS - CHANGE 4 -100W LAMPS TO 90W	40 W	JANITOR - CHANGE 1 -100W LAMP TO 90W	10 W	JANITOR - CHANGE 1 -300W LAMP TO 150W	150 W	EQUIP. RM 208 - CHANGE 2-300W LAMPS TO 150W.	300 W	EQUIP. RM 209 - CHANGE 4-100W LAMPS TO 90W.	40 W	ENTRY - CHANGE 2-100W LAMPS TO 90W.	20 W	KITCHEN - CHANGE 1-100W LAMP TO 90W.	10 W
TOILETS - CHANGE 24 -100W LAMPS TO 90W.	240 W																				
CORRIDORS - CHANGE 9 -100W LAMPS TO 90W	90 W																				
STAIRS - CHANGE 4 -100W LAMPS TO 90W	40 W																				
JANITOR - CHANGE 1 -100W LAMP TO 90W	10 W																				
JANITOR - CHANGE 1 -300W LAMP TO 150W	150 W																				
EQUIP. RM 208 - CHANGE 2-300W LAMPS TO 150W.	300 W																				
EQUIP. RM 209 - CHANGE 4-100W LAMPS TO 90W.	40 W																				
ENTRY - CHANGE 2-100W LAMPS TO 90W.	20 W																				
KITCHEN - CHANGE 1-100W LAMP TO 90W.	10 W																				

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/6/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>E-3 INCANDESCENT REPLACEMENT SAVINGS</b>		COMPUTED BY <b>WBF</b>	CHECKED BY <b>MAW</b>

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

**BUILDING #345                  630 TOTAL WATTS REDUCTION**

TOILETS- CHANGE 4 -100W LAMPS TO 90W.	40 W
TOILETS- CHANGE 2 -200W LAMPS TO 150W.	100 W
TOILETS- CHANGE 1 -150W LAMPS TO 90W.	60 W
CORRIDORS - CHANGE 3 -200W LAMPS TO 150W	150 W
CORRIDORS - CHANGE 2 -100W LAMP TO 90W	20 W
CLOSET - CHANGE 1 -100W LAMP TO 90W	10 W
LOCKER/SHOWERS - CHANGE 21 -100W LAMP TO 90W	210 W
BREAK RM - CHANGE 2-100W LAMPS TO 90W.	20 W
HEAT ROOM - CHANGE 1-100W LAMP TO 90W.	10 W
BOILER ROOM - CHANGE 1-100W LAMP TO 90W.	10 W

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #345 E-3 REPLACE INCANDESCENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,927.66</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,934.00</u>

EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>116,342</u>
MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>113,266</u>

MBTU'S SAVED PER YR. 4.16 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 -6.34 X \$3.15 = (\$20)

ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 10.50 X \$15.50 = \$163

ENERGY SAVINGS PER YEAR	\$143
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LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT LEAVENWORTH      STUDY: FTLVGRUP  
PROJECT NO. & TITLE: DACA41-86-C-0061      FT LEAVENWORTH ESOS      LCCID 1.001      REGION NO. 7

FISCAL YEAR 1987      DISCRETE PORTION NAME: GROUP 4  
ANALYSIS DATE: 07-10-87      ECONOMIC LIFE 25 YEARS      PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	2561.
B. SIOH	\$	256.
C. DESIGN COST	\$	128.
D. ENERGY CREDIT CALC (1A+1B+1C) X.9	\$	2651.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	2651.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	74.	\$ 1149.	11.05	12700.
B. DIST	\$ .00	0.	\$ 0.	16.73	0.
C. RESID	\$ .00	0.	\$ 0.	17.67	0.
D. NAT G	\$ 3.15	-19.	\$ -60.	19.36	-1171.
E. COAL	\$ .00	0.	\$ 0.	13.47	0.
F. TOTAL		55.	\$ 1089.		\$ 11529.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	11.65	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	3805.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F=		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	1089.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	11529.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	4.35	
(IF < 1 PROJECT DOES NOT QUALIFY)		

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent agency

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED	DE
<p>Replace existing incandescent lights with lower wattage incandescent lights or with more efficient fluorescent lamps. Lamp changes will reduce the amount of electrical energy used for lighting and air conditioning without adversely affecting light levels. Also, fairly low cost project, much of which can be done by Fort maintenance personnel.</p>	

FORWARD FOR APPROVAL					
TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT NO YES	ESTIMATED COST	WORK TO BE PERFORMED	FROM
	<input type="checkbox"/> APPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS	FUNDED \$ _____	<input type="checkbox"/> IN-HOUSE	FACILITIES EN  DATE
	<input type="checkbox"/> DISAPPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED	WC <u>K</u> \$ <u>2,817</u>	<input type="checkbox"/> SELF-HELP	
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	WC <u>L</u> \$ _____	<input type="checkbox"/> CONTRACT	
			WC _____ \$ _____	<input type="checkbox"/> TROOP	
			UNFUNDED \$ <u>128</u>		
			TOTAL \$ <u>2,945</u>		
APPROVING AUTHORITY					

WHITE (OR)  
PINK

# ING WORK REQUEST - XFA, XFB, XFC

1420-6: the proponent agency is the Office of the Chief of Engineers.

SHORT JOB DESCRIPTION																																																												BUILDING/FACILITY										BLANK									
																																																												NUMBER																			
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																					
Replace incandescent light																																																																															

BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BUILDING/FACILITY										BLANK									
SUFFIX					NUMBER					SUFFIX					NUMBER					SUFFIX					NUMBER					SUFFIX																			
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80							
P10131451A										P101015121A																																							

lights or amount of sely can be done	DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED  Energy will continue to be wasted by the lighting and air conditioning systems. This ECO would save approximately 55 million BTU's per year.
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PERSON TO CALL FOR ADDITIONAL INFORMATION		
NAME	ORGANIZATION	TELEPHONE NO.

FROM  FACILITIES ENGINEER  DATE	APPROVED FOR DESIGN   SIGNATURE _____ DATE _____	SOURCE OF FUNDS  <input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.
REMARKS		

FORWARDED TO									
DESIGN					ESTIMATOR				
MO	DA	MO	DA	MO	DA	MO	DA	MO	DA
19	20	21	22	23	24	25	26		
THORITY									

WHITE (ORIGINAL) - PROJECT FILE COPY  
 PINK - FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK  
 GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 5</b> Insulate Steam Lines							
102	Building 102	ECO-M5	216.3	\$682	\$1,015	1.5	9.10
1009	Building 1009	ECO-M5	78.5	\$248	\$432	1.7	7.77
USDB	USDB Overall	ECO-M5	1479.0	\$4,658	\$10,486	2.3	6.02
GROUP 5 TOTALS			1773.8	\$5,588	\$11,933	2.1	6.35

<b>ENERGY SAVINGS CALCULATION SHEET</b>		<b>DATE PREPARED</b> FEB. 10, 1987	<b>SHEET</b> 0F 1 1
<b>PROJECT</b> FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY		<b>BASIS FOR CALCULATION</b>	
<b>LOCATION</b>		X HAND CALCULATIONS	
<b>ARCHITECT/ENGINEER</b> CLARK RICHARDSON & BISKUP		COMPUTER CALCULATIONS	
<b>ECO MEASURE</b> INSULATE STEAM LINES		CONTRACTOR BID	
		OTHER (SPECIFY)	
		<b>COMPUTED BY</b> MAW	<b>CHECKED BY</b> DEC

HEAT LOSS VALUES OBTAINED FROM TABLE M5-2

HEAT LOSS PER FOOT OF PIPE 15 PSIG STEAM. TEMP =250°F  
AMBIENT TEMPERATURE = 68°F

COST OF STEAM - \$3.15 / 70% SYSTEM EFF. = \$4.50 PER MILLION BTU

PIPE SIZE	TEMP DIFF.	BARE PIPE LOSS BTUH/LF/°F	2" INSUL. LOSS BTUH/LF/°F	SAVINGS DIFF. BTUH/LF/°F	HOURS/ YEAR	SAVINGS 1000 BTU PER LF/YR	\$ SAVINGS PER LF/YR	\$PER FT INSLU. COST
2"	182°F	1.53	0.151	1.379	4,380	1,099	\$4.95	\$7.85
3"	182°F	2.15	0.195	1.955	4,380	1,558	\$7.01	\$8.95
4"	182°F	2.65	0.231	2.419	4,380	1,928	\$8.68	\$10.60

HEAT LOSS PER FOOT OF PIPE CONDENSATE LINE TEMP =180°F  
AMBIENT TEMPERATURE = 68°F

COST OF STEAM - \$3.15 / 70% SYSTEM EFF. = \$4.50 PER MILLION BTU

PIPE SIZE	TEMP DIFF.	BARE PIPE LOSS BTUH/LF/°F	2" INSUL. LOSS BTUH/LF/°F	SAVINGS DIFF. BTUH/LF/°F	HOURS/ YEAR	SAVINGS 1000 BTU PER LF/YR	\$ SAVINGS PER LF/YR	\$PER FT INSLU. COST
1"	112°F	0.93	0.108	0.822	4,380	403	\$1.81	\$7.85
2"	112°F	1.53	0.151	1.379	4,380	676	\$3.04	\$8.95
4"	112°F	2.65	0.231	2.419	4,380	1,187	\$5.34	\$10.60
6"	112°F	3.7	0.305	3.395	4,380	1,665	\$7.49	\$12.80
8"	112°F	4.75	0.388	4.362	4,380	2,140	\$9.63	\$15.95

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>FEB. 10, 1987</b>	SHEET OF <b>1 1</b>
PROJECT <b>FORT LEAVENWORTH</b> <b>ENERGY SAVINGS OPPORTUNITY SURVEY</b>		BASIS FOR CALCULATION	
LOCATION		<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>INSULATE STEAM LINES</b>		COMPUTED BY <b>MAW</b>	CHECKED BY <b>DEC</b>

**BUILDING NO. 1009**

15 PSI STEAM

PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL. \$
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2"	50	54,964	\$247	\$393
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BUILDING TOTAL =	54,964	\$247	\$393
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**BUILDING NO. 102**

15 PSI STEAM

PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL. \$
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2"	50	54,964	\$247	\$393
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4"	50	96,417	\$434	\$530
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BUILDING TOTAL =	151,381	\$681	\$923
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>FEB. 10, 1987</b>	SHEET OF <b>1 1</b>
PROJECT <b>FORT LEAVENWORTH</b> <b>ENERGY SAVINGS OPPORTUNITY SURVEY</b>		BASIS FOR CALCULATION  X <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)	
LOCATION			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>INSULATE STEAM LINES</b>		COMPUTED BY <b>MAW</b>	CHECKED BY <b>DEC</b>

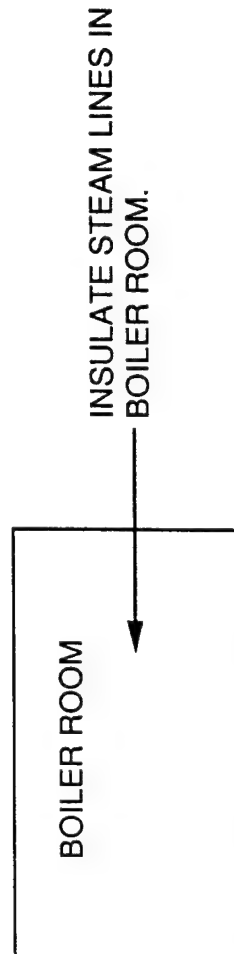
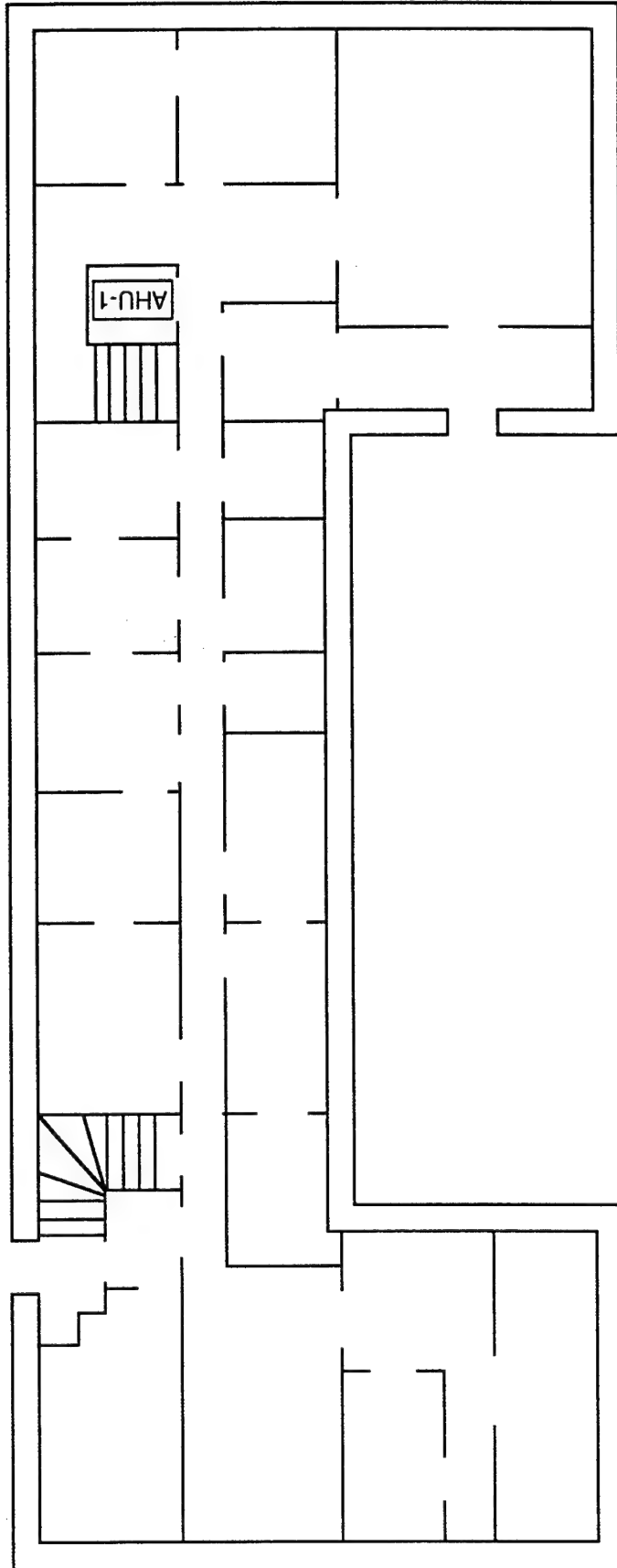
**USDB OVERALL**

**15 PSI STEAM**

BUILDING	PIPE SIZE	FEET OF UNINSULATED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL.\$
468	2"	10	10,993	\$49	\$79
471	3"	170	264,936	\$1,192	\$1,522
472	2"	10	10,993	\$49	\$79
485	2"	150	164,893	\$742	\$1,178
486	2"	20	21,986	\$99	\$157
496	2"	150	164,893	\$742	\$1,178
15 PSI TOTAL =			638,693	\$2,874	\$4,191

**CONDENSATE LINE**

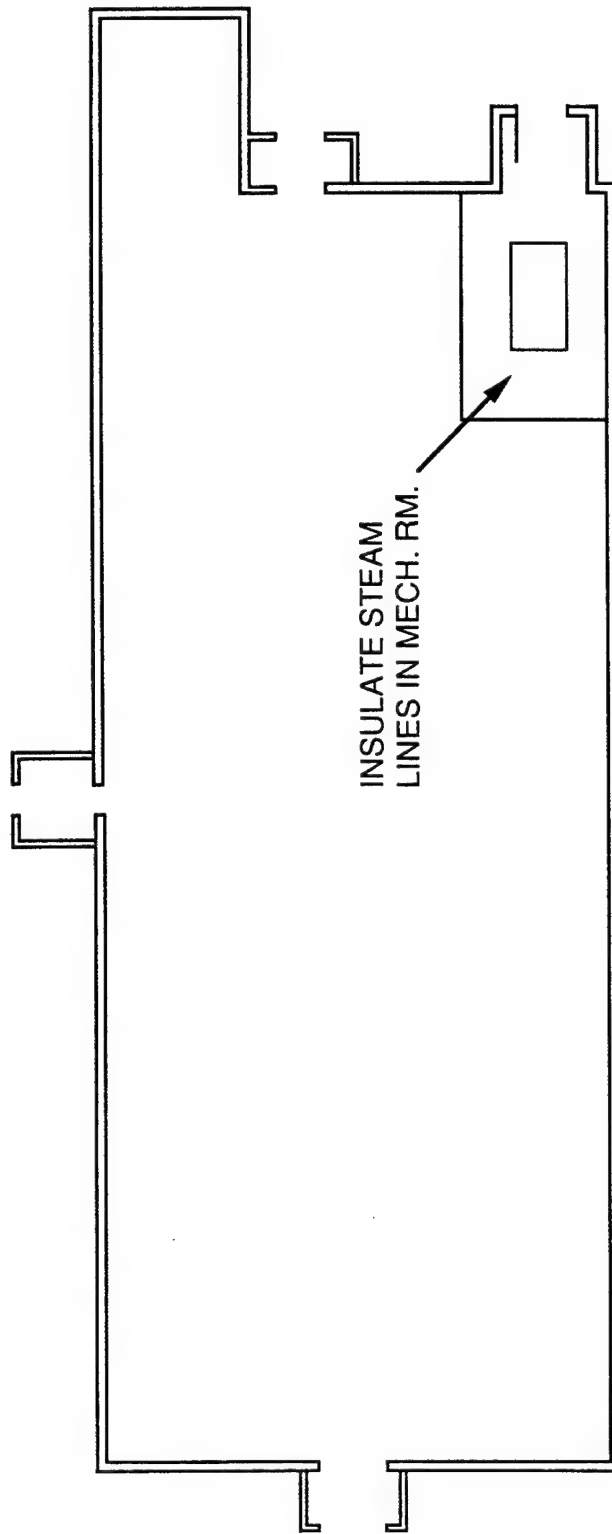
STEAM TUNNEL	8"	60	128,389	\$578	\$957
466	2"	30	20,294	\$91	\$269
468	1"	10	4,032	\$18	\$79
471	2"	170	115,002	\$518	\$1,522
485	1"	150	60,486	\$272	\$1,178
486	1"	20	8,065	\$36	\$157
496	1"	150	60,486	\$272	\$1,178
CONDENSATE LINE TOTAL =			396,755	\$1,785	\$5,338



**BUILDING 102 - FIRST FLOOR**  
Not to Scale

ECO -M5





ECO-M5

LIFE CYCLE COST ANALYSIS SUMMARY  
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)  
INSTALLATION & LOCATION: FT LEAVENWORTH  
PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

STUDY: FTLVGRUP  
LCCID 1.001

REGION NO. 7

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP 5

ANALYSIS DATE: 05-31-89

ECONOMIC LIFE 15 YEARS

PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	10848.
B. SIOH	\$	1085.
C. DESIGN COST	\$	542.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	11228.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	11228.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	0.	\$ 0.	8.59	0.
B. DIST	\$ .00	0.	\$ 0.	11.28	0.
C. RESID	\$ .00	0.	\$ 0.	12.01	0.
D. NAT G	\$ 3.15	1774.	\$ 5588.	12.76	71300.
E. COAL	\$ .00	0.	\$ 0.	10.17	0.
F. TOTAL		1774.	\$ 5588.		\$ 71300.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	9.11	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	23529.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F=	_____	
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	5588.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	71300.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	6.35	
(IF < 1 PROJECT DOES NOT QUALIFY)		

## FACILITIES ENGINEERING WORK REQUEST

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent

TRANS CODE	CHANGE	DOCUMENT NUMBER											BUILDING/FACILITY		DATE			OTHER FUND CITATION																											
		REQ ID	SERIAL NUMBER									FY	TYPE	NUMBER		SUFFIX	YR	MO	DA																										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43			
X	F	A																																											
PIUISIDIBIA 9 10 16 0 6																																													
TRANS CODE	CHANGE	DOCUMENT NUMBER											BUILDING/FACILITY		BUILDING/FACILITY			BUILDING/FACILITY		BUILDING/FACILITY		BUILDING/FACILITY																							
		REQ ID	SERIAL NUMBER									FY	TYPE	NUMBER		SUFFIX	NUMBER		SUFFIX	NUMBER		SUFFIX	NUMBER																						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43			
X	F	B	C																																										
PI0110121A P11010191A																																													

## DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED

Insulate sections of existing steam lines. Some lines are very old and no insulation was installed originally. In other areas the insulation was damaged or missing. Uninsulated steam lines waste energy by allowing the heat to escape uncontrolled into utility tunnels or mechanical rooms. Uninsulated steam lines are also hazardous to maintenance personnel, and are capable of causing severe burns.

## REQUESTER INFORMATION

NAME	ORGANIZATION	TELEPHONE NO.	SIGNATURE
------	--------------	---------------	-----------

## FORWARD FOR APPROVAL

TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT	ESTIMATED COST	WORK TO BE PERFORMED	FROM
APPROVING AUTHORITY	<input type="checkbox"/> APPROVAL <input type="checkbox"/> DISAPPROVAL	NO YES <input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS <input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED <input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	FUNDED \$ _____ WC K \$ 11,933 WC L \$ _____ WC _____ \$ _____ UNFUNDED \$ 542 TOTAL \$ 12,475	<input type="checkbox"/> IN-HOUSE <input type="checkbox"/> SELF-HELP <input type="checkbox"/> CONTRACT <input type="checkbox"/> TROOP	FACILITY

## APPROVAL ACTION

TRANS CODE	CHANGE	DOCUMENT NUMBER											ACTION TAKEN	DATE		SIGNATURE OF APPROVAL AUTHORITY	FOR			
		REQ ID	SERIAL NUMBER									FY		TYPE	MO			DA		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
X	F	C	C											A - APPROVED						
D - DISAPPROVED																				

DA FORM 1 AUG 78 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

WHITE  
PINK

ERING WORK REQUEST – XFA, XFB, XFC  
am 420–6: the proponent agency is the Office of the Chief of Engineers.

ON	SHORT JOB DESCRIPTION																																																							BUILDING/FACILITY				BLANK																			
																																																							NUMBER				SUFFIX																				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																				
All insullate steam lines																																																																															
ACILITY				BUILDING/FACILITY											BUILDING/FACILITY											BUILDING/FACILITY											BUILDING/FACILITY											BLANK																															
SUFFIX				NUMBER											SUFFIX											NUMBER											SUFFIX											NUMBER											SUFFIX																				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																				
A				A											A											A											A											A																															
and no was damaged it to escape steam lines ng severe				DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																																											
				If the lines remain uninsulated, steam energy will continue to be wasted and the pipes will continue to be a safety hazard. This ECO would save approximately 1774 million BTU's per year.																																																																											
				PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																											
				NAME																																	ORGANIZATION																																	TELEPHONE NO.									

TO BE RMED		FROM	
HOUSE		FACILITIES ENGINEER	
-HELP			
TRACT		DATE	
OP			

APPROVED FOR DESIGN				SOURCE OF FUNDS							
SIGNATURE				DATE				<input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.			
REMARKS											

FORWARDED TO													
DESIGN						ESTIMATOR							
MO		DA		MO		DA		MO		DA			
19	20	21	22	23	24	25	26						
AUTHORITY													

WHITE (ORIGINAL) – PROJECT FILE COPY  
PINK – FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK

GREEN – FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2

**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 6</b> Reduce Infiltration							
25	Building 25	ECO -A3	224.0	\$1,090	\$5,294	4.9	3.43
25	Building 25	ECO -A5	167.0	\$525	\$6,379	12.2	4.76
77	Building 77	ECO -A3	39.0	\$517	\$5,811	11.2	1.08
345	Building 345	ECO -A3	18.0	\$66	\$314	4.8	3.96
345	Building 345	ECO -A6	60.0	\$206	\$1,004	4.9	4.04
1008	Building 1008	ECO -A3	130.0	\$621	\$4,253	6.8	2.45
1009	Building 1009	ECO -A5	146.0	\$683	\$6,832	10.0	1.70
GROUP 6 TOTALS			784.0	\$3,708	\$29,887	8.1	2.09

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #25 A3 WEATHERIZATION SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 548.00 MBTU  
 INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 432.00 MBTU

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 290.00 MBTU  
 INSULATION BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 259.00 MBTU

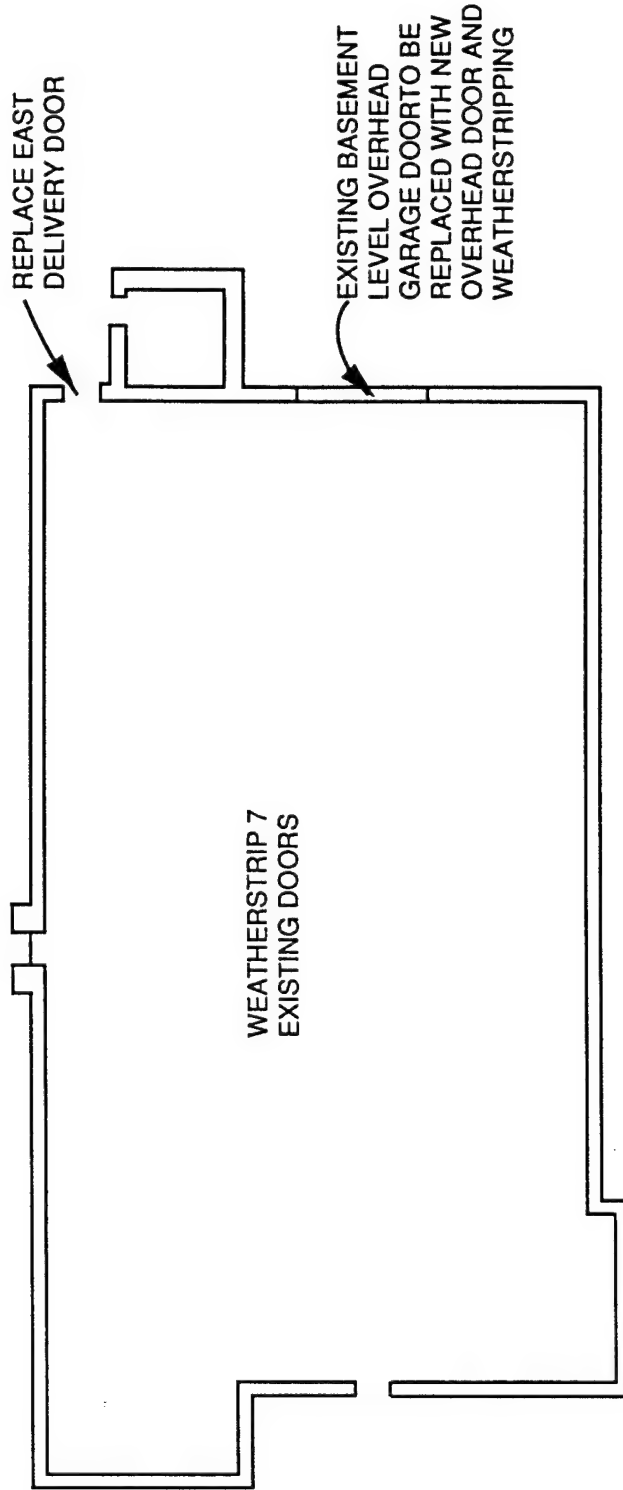
MBTU'S SAVED PER YR. 147.00 MBTU

HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL MBTU'S SAVED PER YEAR  
 116.00 / 60% = 193.33

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 193.33 X \$3.15 = \$609

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 31.00 X \$15.50 = \$481

ENERGY SAVINGS PER YEAR	\$1,090
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET 0F <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #25 A5 VESTIBULES</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 548.00 MBTU  
 INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 448.00 MBTU

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) - MBTU  
 INSULATION BUILDING COOLING ENERGY USAGE (MBTU PER YR.) - MBTU

MBTU'S SAVED PER YR. 100.00 MBTU

HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL MBTU'S SAVED PER YEAR  
 100.00 / 60% = 166.67

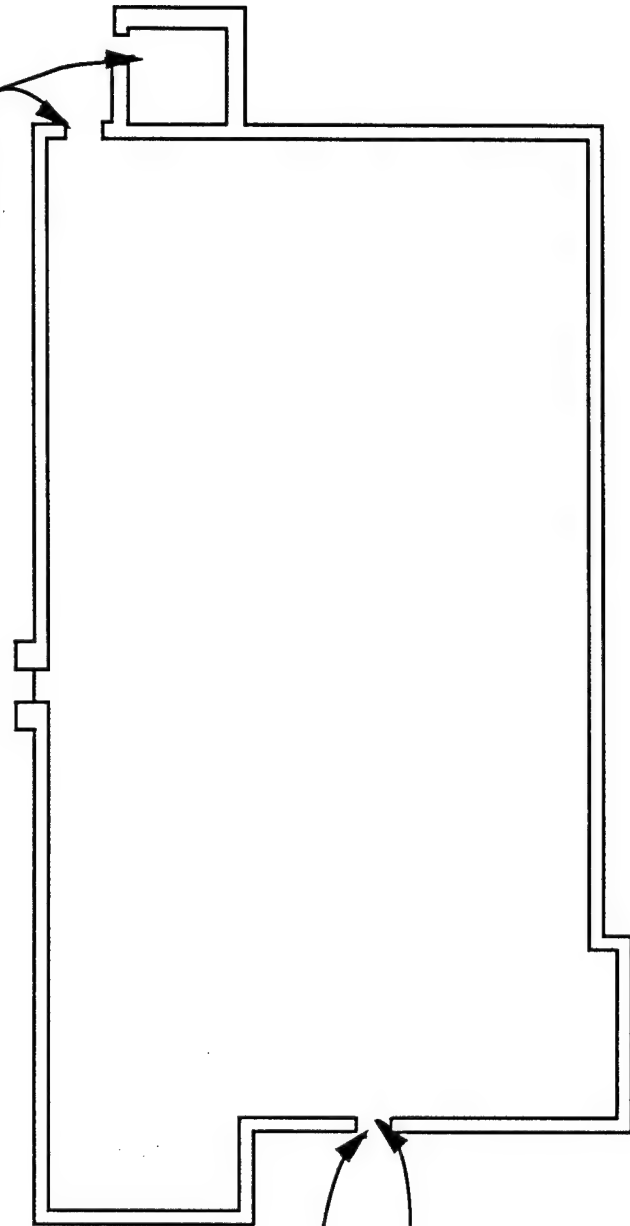
MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 166.67 X \$3.15 = \$525

COOLING MBTU SAVED PER YEAR =0  
 BUILDING NOT AIR CONDITIONED

ENERGY SAVINGS PER YEAR	\$525
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NORTH AND EAST FACING SINGLE  
PASSAGE DOORS NEED INTERIOR  
VESTIBULE



MAIN ENTRY EXT. VESTIBULE  
BUILT ON EXISTING PORCH  
(UPPER FLOOR)

NEW ENTRANCE VESTIBULE  
FOR BASEMENT ENTRY DOOR



**BUILDING 25**

Not to Scale

ECO-A5

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET OF 1 1
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #77 A3 WEATHERIZATION SAVINGS</b>		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 1,047.00 MBTU  
 INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 1,043.00 MBTU

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 1,239.00 MBTU  
 INSULATION BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 1,207.00 MBTU

MBTU'S SAVED PER YR. 36.00 MBTU

HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL MBTU'S SAVED PER YEAR  
 4.00 / 60% = 6.67

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 6.67 X \$3.15 = \$21

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 32.00 X \$15.50 = \$496

ENERGY SAVINGS PER YEAR	\$517
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET 0F 1 1
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input checked="" type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BUILD #345 A3 WEATHERIZATON SAVINGS</b>		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,927.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,910.00</u>

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>116,342</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>116,112</u>

MBTU'S SAVED PER YR. 17.78 MBTU

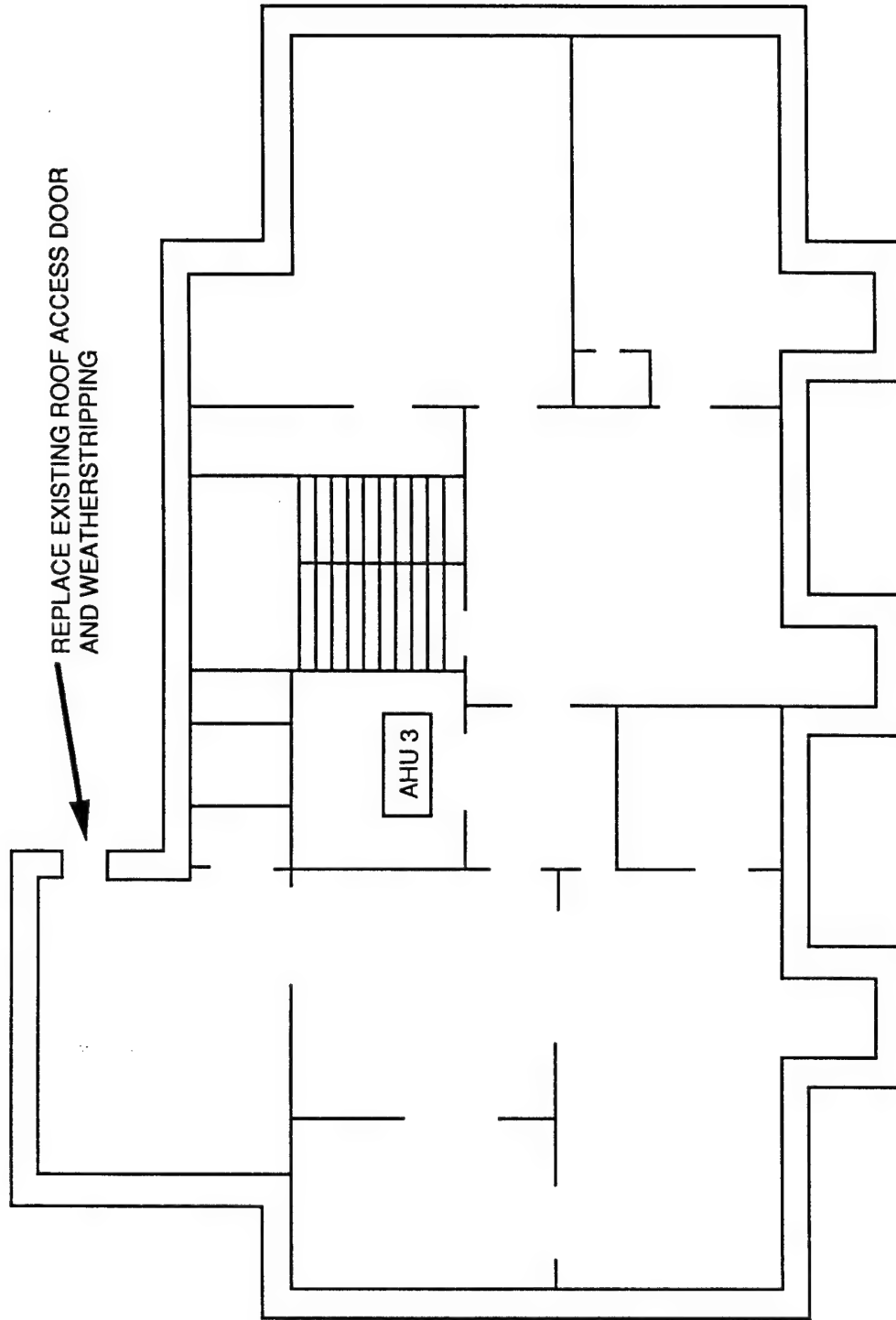
HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

17.00	X	\$3.15	=	\$54
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COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

0.78	X	\$15.50	=	\$12
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ENERGY SAVINGS PER YEAR	\$66
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**BUILDING 345 - THIRD FLOOR** ECO-A3

Not to Scale

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET OF 1 1
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION	
LOCATION <b>FORT LEAVENWORTH</b>		<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #345 A-6 REDUCE GLASS AREA SAVINGS</b>		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,927.66</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,868.76</u>

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>116,342</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>115,964</u>

MBTU'S SAVED PER YR. 60.19 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

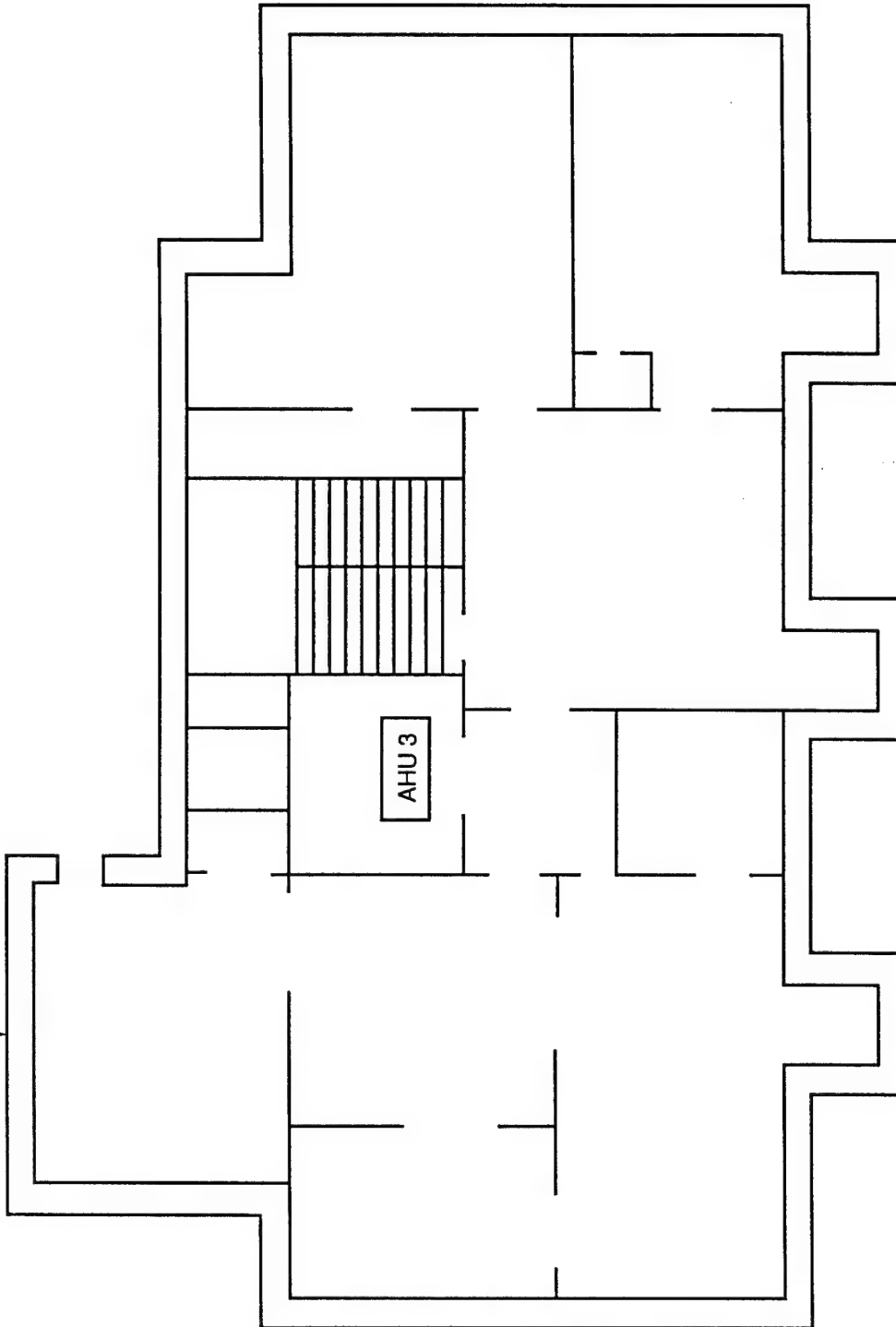
58.90	X	\$3.15	=	\$186
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COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

1.29	X	\$15.50	=	\$20
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ENERGY SAVINGS PER YEAR	\$206
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REMOVE AND FILL EXISTING  
THREE WINDOWS



**BUILDING 345 - THIRD FLOOR**

Not to Scale

ECO-A6

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET 0F 1 1
PROJECT ESOS		BASIS FOR CALCULATION  HAND CALCULATIONS COMPUTER CALCULATIONS CONTRACTOR BID X OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #1008 A-3 WEATHERIZATION		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 661.00 MBTU  
 INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 593.00 MBTU

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 368.00 MBTU  
 INSULATION BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 351.00 MBTU

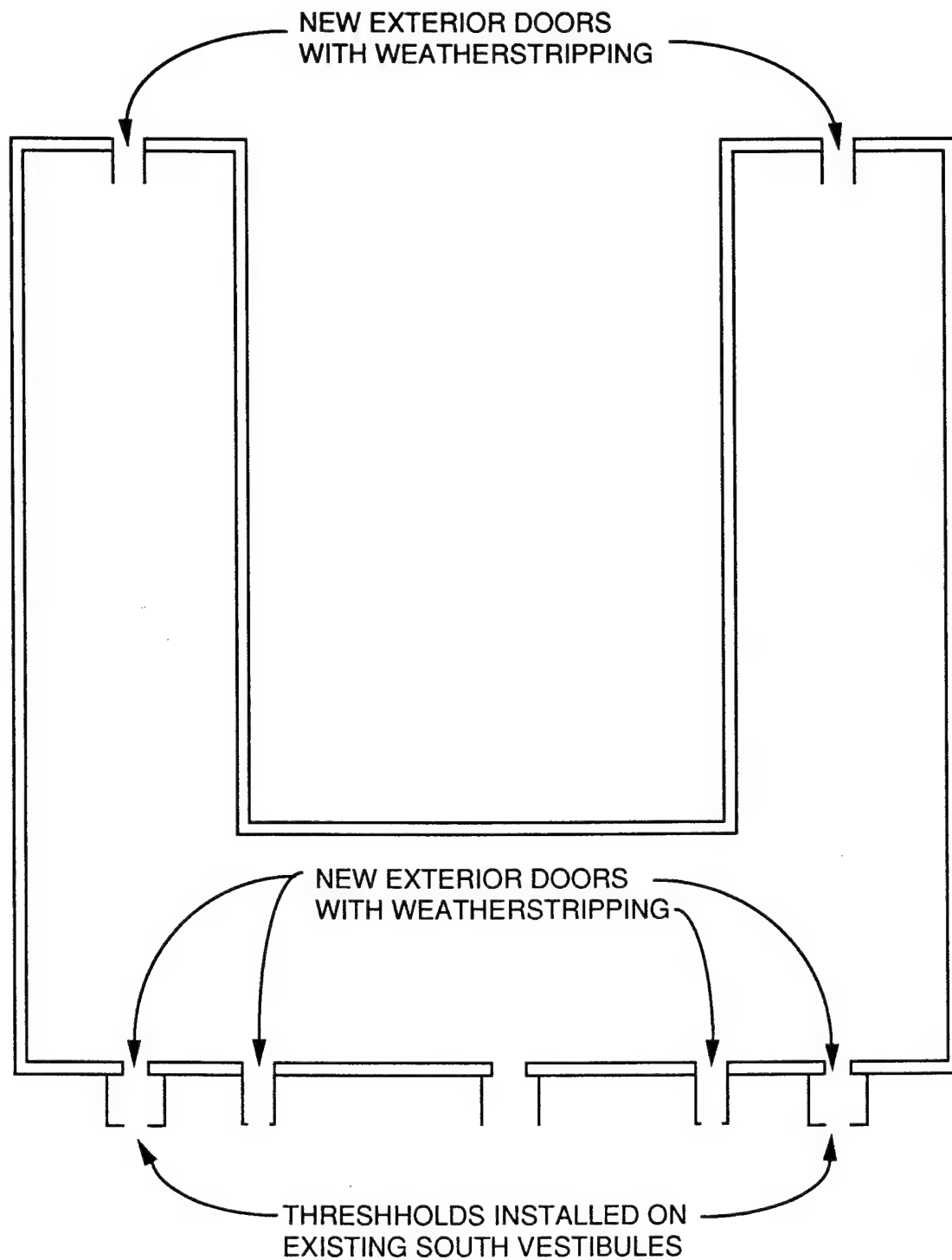
MBTU'S SAVED PER YR. 85.00 MBTU

HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL MBTU'S SAVED PER YEAR  
 68.00 / 60% = 113.33

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 113.33 X \$3.15 = \$357

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 17.00 X \$15.50 = \$264

ENERGY SAVINGS PER YEAR	\$621
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**BUILDING 1008**

Not to Scale

ECO-A3



For use of this form, see AR 420-17 and DA Pam 420-6; the proponent age

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED			
<p>Heat loss by infiltration is a major contributor to building energy use and comfort control. Keeping infiltration to a minimum will not only reduce the heating energy directly, but allow occupants to use lower winter temperature settings. Infiltration is reduced in the following manners:</p> <p><u>Weatherization</u> - includes caulking, weatherstripping and sealing cracks, doors and windows. <u>Vestibules</u> - will reduce the amount of infiltration through commonly used doors. <u>Reducing the glass area</u> - removing windows and replacing them with insulated insert panels, reducing solar gain in summer &amp; heat loss &amp; infiltration in winter.</p>			
REQUESTER INFORMATION			
NAME	ORGANIZATION	TELEPHONE NO.	SIGNATURE

FORWARD FOR APPROVAL					
TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT NO YES	ESTIMATED COST	WORK TO BE PERFORMED	FROM
	<input type="checkbox"/> APPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS	FUNDED \$ _____	<input type="checkbox"/> IN-HOUSE	FACILITIES & _____ DATE
	<input type="checkbox"/> DISAPPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED	WC <u>K</u> \$ <u>38,546</u>	<input type="checkbox"/> SELF-HELP	
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	WC <u>L</u> \$ _____	<input type="checkbox"/> CONTRACT	
			WC _____ \$ _____	<input type="checkbox"/> TROOP	
APPROVING AUTHORITY			UNFUNDED \$ <u>1,752</u>		
			TOTAL \$ <u>40,298</u>		

														APPROVAL ACTION										
INS CODE			CHANGE	DOCUMENT NUMBER										ACTION TAKEN	DATE			FORWARD						
				REQ ID	SERIAL NUMBER				FY	TYPE	MO	DA	DESIGN		MO	DA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14		15	16	17	18		19	20	21	22	
XIFIC														A - APPROVED D - DISAPPROVED					SIGNATURE OF APPROVAL AUTHORITY					

am 420-6; the proponent agency is the Office of the Chief of Engineers.

TO BE RMED   HOUSE -HELP TRACT OP	FROM   <hr/> FACILITIES ENGINEER   <hr/> DATE
---	---

APPROVED FOR DESIGN      <hr/> SIGNATURE	SOURCE OF FUNDS   <input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.
--	---

AUTHORITY	REMARKS
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	FORWARDED TO							
	DESIGN				ESTIMATOR			
	MO	DA	MO	DA	MO	DA	MO	DA
	19	20	21	22	23	24	25	26

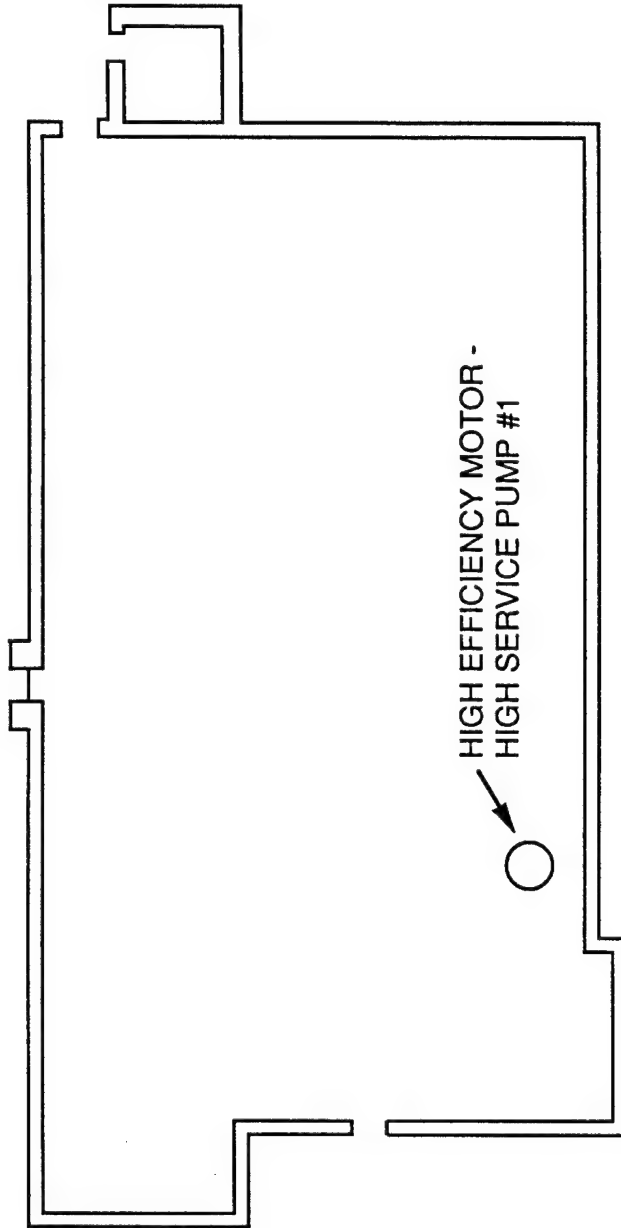
**GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK**

2

**ENERGY CONSERVATION ANALYSIS**  
**ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 7</b> Replace Motors							
25	Building 25	ECO-E4	150.1	\$2,327	\$14,793	7.0	1.68
345	Building 345	ECO-E4	18.9	\$293	\$2,680	9.1	1.28
470	Building 470	ECO-E4	26.7	\$414	\$3,469	8.4	1.40
USDB	USDB Overall	ECO-E4	136.0	\$2,108	\$18,206	8.6	1.36
GROUP 7 TOTALS			331.7	\$5,142	\$39,148	7.6	1.54

<b>ENERGY SAVINGS CALCULATION SHEET</b>					DATE PREPARED <b>7/10/87</b>		SHEET <b>1</b> OF <b>1</b>		
PROJECT <b>FORT LEAVENWORTH</b> ENERGY SAVINGS OPPORTUNITY SURVEY					BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)				
LOCATION <b>BUILDING 25 WATER TREATMENT PLANT</b>									
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>									
ECO MEASURE <b>ENERGY EFFICIENT MOTORS</b>					COMPUTED BY <b>MAW</b>		CHECKED BY <b>DEC</b>		
MOTOR ENERGY SAVINGS									
QUAN.	DESCRIPTION	HP	WATT LOSS SAVINGS	OPER. HOURS/ YEAR	SAVINGS PER YEAR MBTU'S	SAVINGS PER YEAR DOLLARS	INSTALLED COST	SIR	PAYBACK YEARS
1	AIR COMPRESSOR	2	350	4380	5.2	\$81	\$466	1.9	5.7
1	CO2 COMPRESSOR	3	400	4380	6.0	\$93	\$582	1.8	6.3
2	PRIMING & BACK- WASH PUMPS	5	500	4380	14.9	\$232	\$1,288	2.0	5.6
1	LIME CONVEYOR	25	1300	4380	19.4	\$301	\$1,780	1.9	5.9
1	AIR COMPRESSORS	40	1700	4380	25.4	\$394	\$2,623	1.7	6.7
1	HIGH SERVICE PUMP #1	100	6800	4380	101.7	\$1,576	\$8,520	2.0	5.4
TOTALS					172.7	\$2,676	\$15,259	1.9	5.7
25 YEAR DISCOUNT FACTOR    11.05									



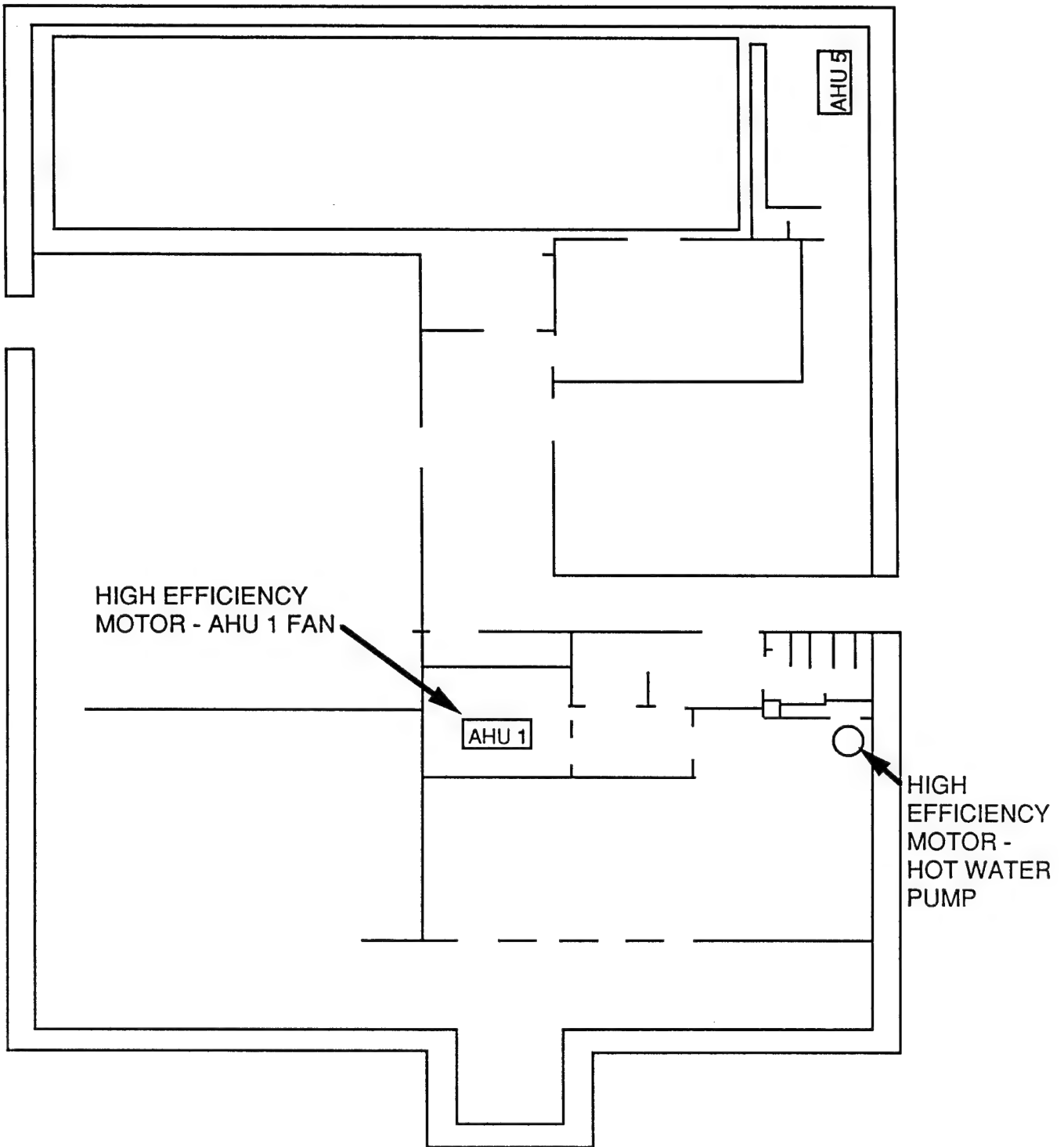
ECO-E4

ENERGY SAVINGS CALCULATION SHEET		DATE PREPARED 7/10/87	SHEET 1	OF 1
PROJECT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY		BASIS FOR CALCULATION		
LOCATION BUILDING 345 PATCH COMMUNITY CENTER		<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)		
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP				
ECO MEASURE ENERGY EFFICIENT MOTORS		COMPUTED BY MAW	CHECKED BY DEC	

MOTOR ENERGY SAVINGS

QUAN.	DESCRIPTION	HP	WATT LOSS SAVINGS	OPER. HOURS/ YEAR	SAVINGS PER YEAR MBTU'S	SAVINGS PER YEAR DOLLARS	INSTALLED COST	SIR	PAYBACK YEARS
3	AHU FANS 1,2,3.	1.5	300	4380	13.5	\$209	\$1,326	1.7	6.4
1	AHU FAN 4	2	350	4380	5.2	\$81	\$466	1.9	5.7
1	HEATING WTR PUMP	5	500	4380	7.5	\$116	\$644	2.0	5.6
TOTALS					26.2	\$405	\$2,436	1.8	6.0

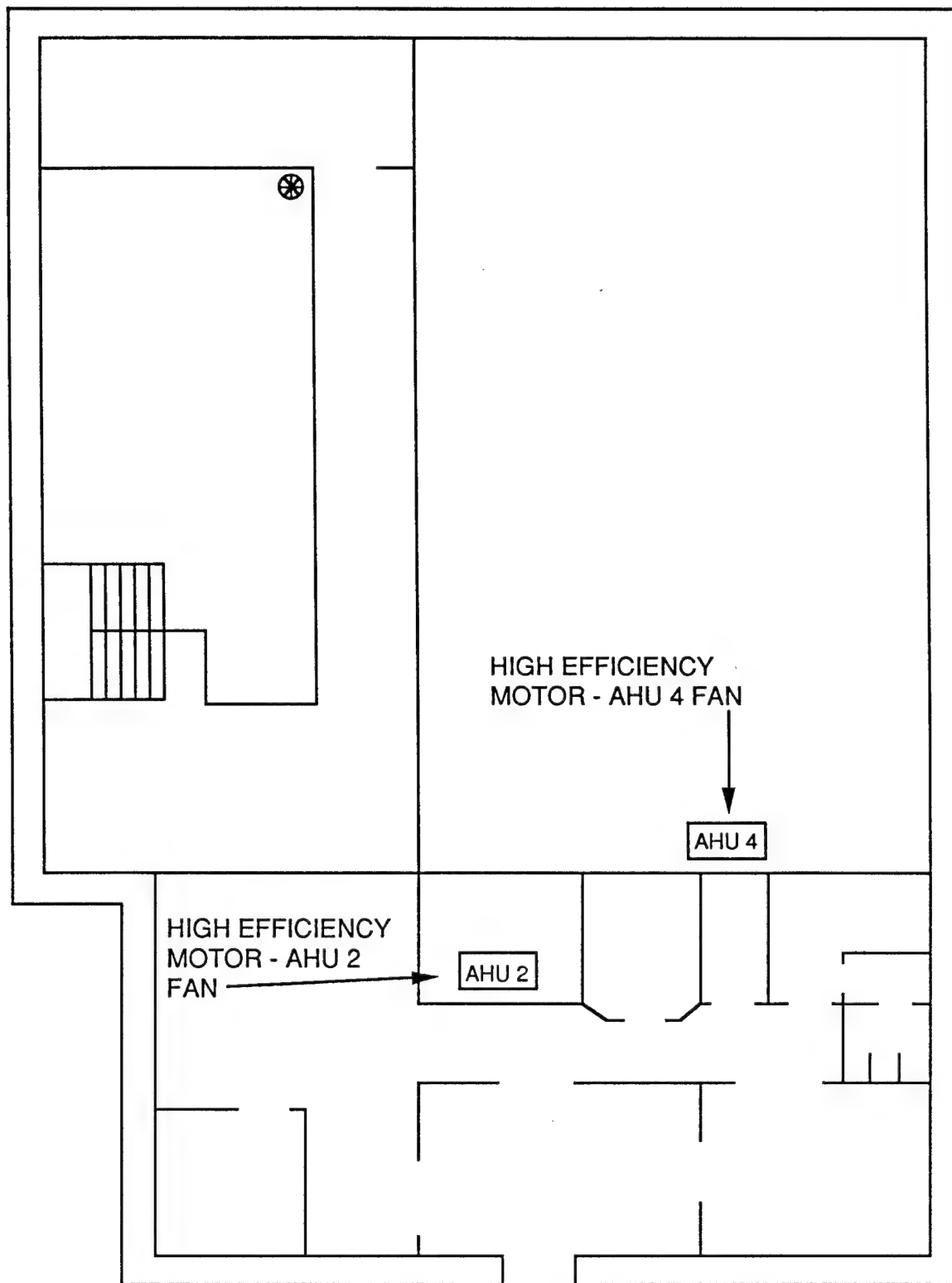
25 YEAR DISCOUNT FACTOR 11.05



**BUILDING 345 - BASEMENT**

Not to Scale

ECO-E4

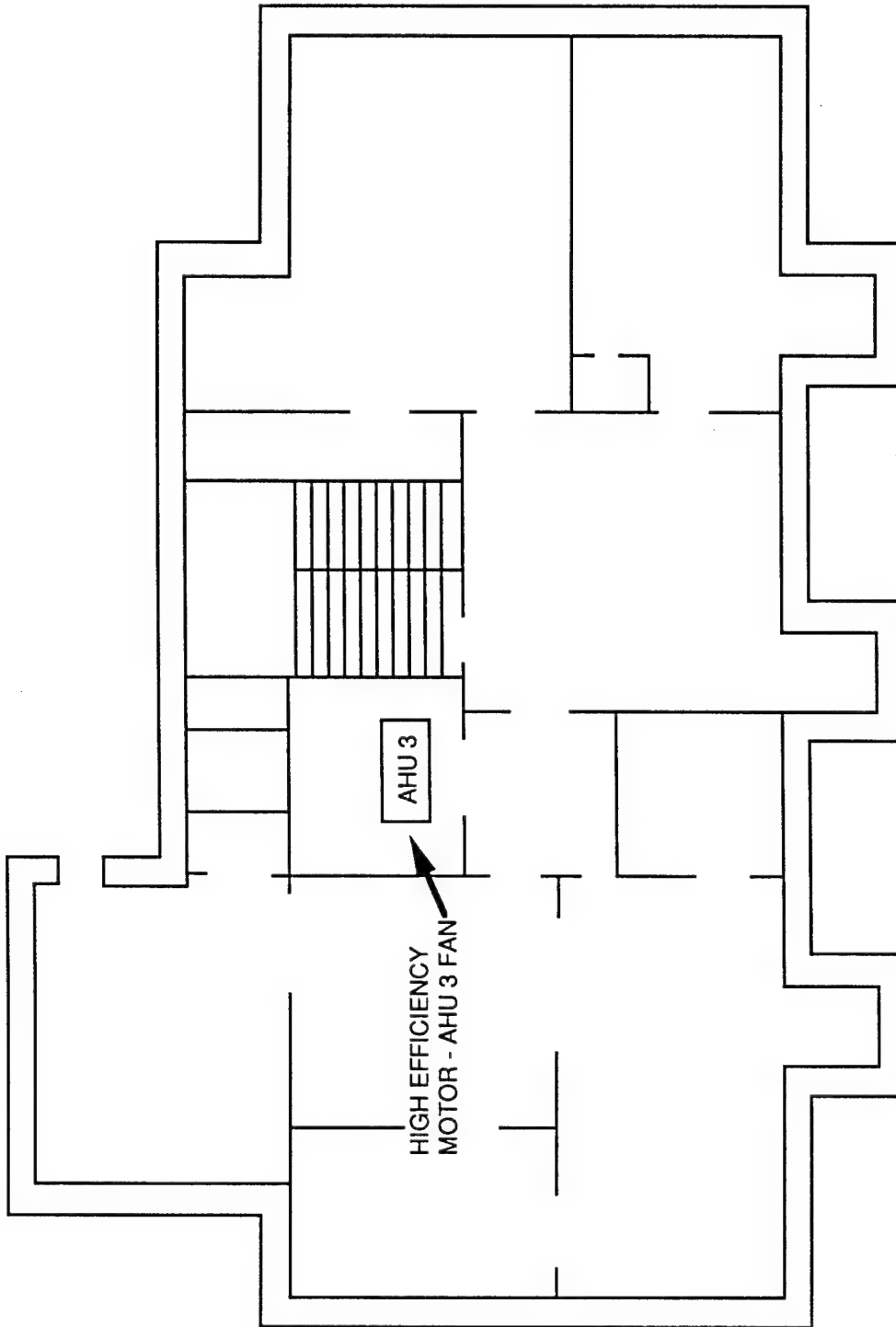


**BUILDING 345 - SECOND FLOOR**

Not to Scale

ECO-E4





ECO-E4

**BUILDING 345 - THIRD FLOOR**

Not to Scale

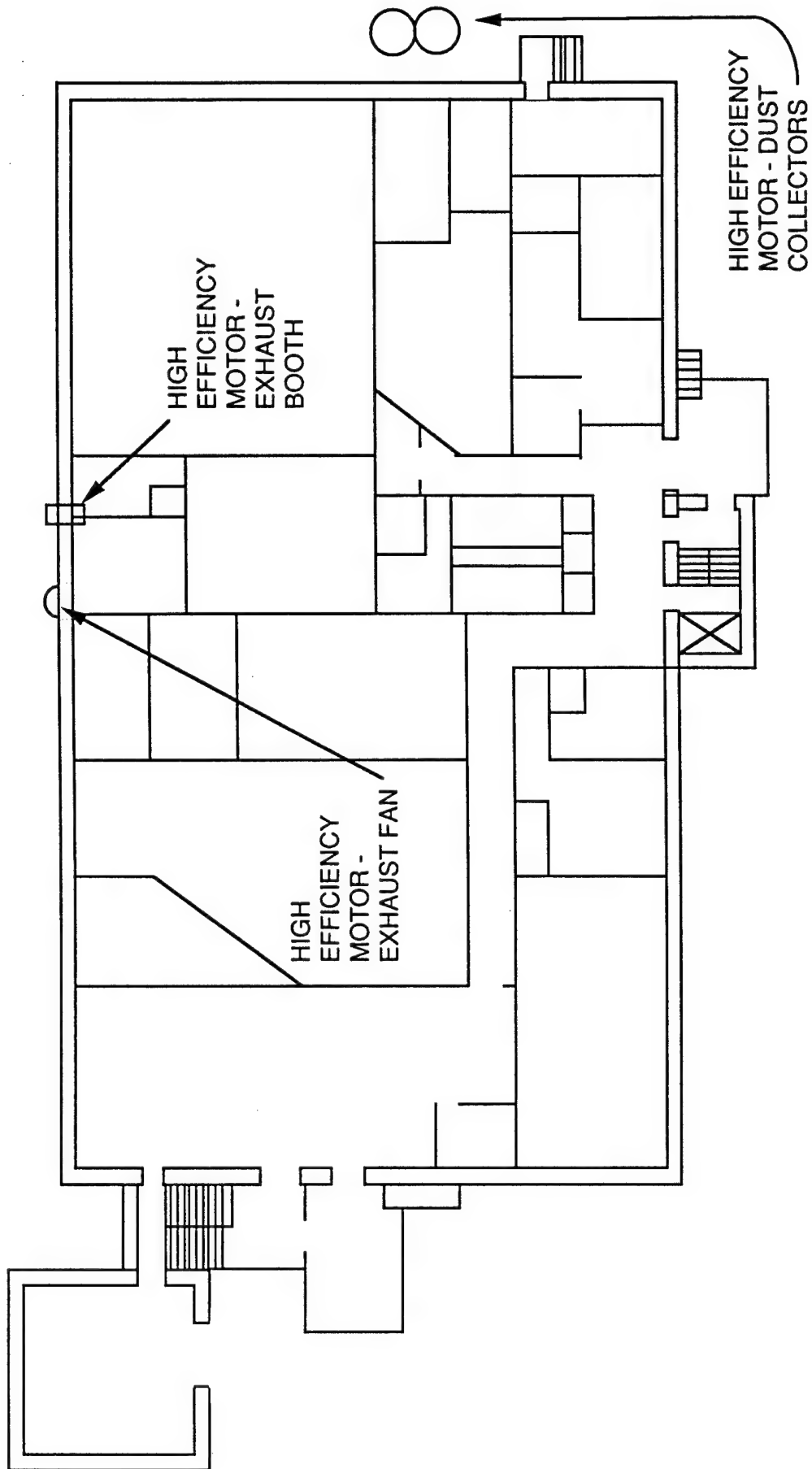


<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>7/10/87</b>		SHEET <b>1</b>		OF <b>1</b>	
PROJECT FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY				BASIS FOR CALCULATION			
LOCATION <b>BUILDING 470 POPE HALL</b>				<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>				COMPUTED BY <b>MAW</b>		CHECKED BY <b>DEC</b>	
ECO MEASURE <b>ENERGY EFFICIENT MOTORS</b>							

MOTOR ENERGY SAVINGS

QUAN.	DESCRIPTION	HP	WATT LOSS SAVINGS	OPER. HOURS/ YEAR	SAVINGS PER YEAR MBTU'S	SAVINGS PER YEAR DOLLARS	INSTALLED COST	SIR	PAYBACK YEARS
1	EXHAUST FAN	1	300	4380	4.5	\$70	\$420	1.8	6.0
1	EXHAUST BOOTH	5	500	4380	7.5	\$116	\$644	2.0	5.6
2	DUST COLLECTORS	15	1000	4380	29.9	\$463	\$2,510	2.0	5.4
TOTALS					41.9	\$649	\$3,574	2.0	5.5

25 YEAR DISCOUNT FACTOR 11.05



**BUILDING 470 - FIRST FLOOR**

Not to Scale

ECO-E4

<b>ENERGY SAVINGS CALCULATION SHEET</b>					DATE PREPARED <b>7/10/87</b>		SHEET <b>1</b>		OF <b>2</b>	
PROJECT <b>FORT LEAVENWORTH</b> ENERGY SAVINGS OPPORTUNITY SURVEY					BASIS FOR CALCULATION					
LOCATION <b>USDB</b>					<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)					
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>					COMPUTED BY <b>MAW</b>		CHECKED BY <b>DEC</b>			
ECO MEASURE <b>ENERGY EFFICIENT MOTORS</b>										
MOTOR ENERGY SAVINGS										
QUAN.	DESCRIPTION	HP	WATT LOSS SAVINGS	OPER. HOURS/ YEAR	SAVINGS PER YEAR MBTU'S	SAVINGS PER YEAR DOLLARS	INSTALLED COST	SIR	PAYBACK YEARS	
UTILITY TUNNEL VENTILATION SYSTEM										
1	EXHAUST FAN #1	3	400	4380	6.0	\$93	\$582	1.8	6.3	
2	EXHAUST FAN #2 & #3	2	350	4380	10.5	\$162	\$932	1.9	5.7	
BUILDING #473										
1	PUMP #1	5	500	4380	7.5	\$116	\$644	2.0	5.6	
1	PUMP #2	3	400	4380	6.0	\$93	\$582	1.8	6.3	
BUILDING #472										
1	HOT WATER PUMP	3	350	4380	5.2	\$81	\$582	1.5	7.2	
BUILDING #467										
1	MUA #1	1	300	4380	4.5	\$70	\$420	1.8	6.0	
1	MUA #2	5	500	4380	7.5	\$116	\$644	2.0	5.6	
BUILDING #466										
1	HEATING WTR PUMP	2	350	4380	5.2	\$81	\$466	1.9	5.7	
1	AHU FAN MOTOR	5	500	4380	7.5	\$116	\$644	2.0	5.6	
SHEET TOTALS					59.8	\$927	\$5,496	1.9	5.9	
25 YEAR DISCOUNT FACTOR    11.05										

<b>ENERGY SAVINGS CALCULATION SHEET</b>					DATE PREPARED <b>7/10/87</b>		SHEET <b>2</b>		OF <b>2</b>		
PROJECT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY					BASIS FOR CALCULATION						
LOCATION <b>USDB</b>					<input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY)						
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>					COMPUTED BY <b>MAW</b>		CHECKED BY <b>DEC</b>				
ECO MEASURE <b>ENERGY EFFICIENT MOTORS</b>											
MOTOR ENERGY SAVINGS											
QUAN.	DESCRIPTION	HP	WATT LOSS SAVINGS	OPER. HOURS/ YEAR	SAVINGS PER YEAR MBTU'S	SAVINGS PER YEAR DOLLARS	INSTALLED COST	SIR	PAYBACK YEARS		
BUILDING #465											
1	HOT WTR PUMP	7.5	650	4380	9.7	\$151	\$820	2.0	5.4		
1	AHU #1	2	350	4380	5.2	\$81	\$466	1.9	5.7		
2	AHU #2 & #3	1	300	4380	9.0	\$139	\$840	1.8	6.0		
1	CENTRIFUGAL PUMP	1.5	300	4380	4.5	\$70	\$442	1.7	6.4		
STEAM & ELECTRIC PLANT											
1	BOILER FEED PUMP	40	1700	4380	25.4	\$394	\$2,623	1.7	6.7		
3	FORCE DRAFT FAN #1, #2, & #3	10	800	4380	35.9	\$556	\$2,898	2.1	5.2		
2	CONDENSATE PUMP #1 & #2	10	800	4380	23.9	\$371	\$1,932	2.1	5.2		
1	AIR COMPRESSOR STARTUP	3	400	4380	6.0	\$93	\$582	1.8	6.3		
1	AIR COMPRESSOR	25	1300	4380	19.4	\$301	\$1,780	1.9	5.9		
BUILDING #472											
1	AHU	1	300	4380	4.5	\$70	\$420	1.8	6.0		
1	HOT WATER PUMP	3	400	4380	6.0	\$93	\$582	1.8	6.3		
SHEET TOTALS					149.5	\$2,317	\$13,385	1.9	5.8		
25 YEAR DISCOUNT FACTOR    11.05											
USDB TOTAL					209.3	\$3,244	\$18,881	1.9	5.8		

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT LEAVENWORTH      STUDY: FTLVGRUP  
PROJECT NO. & TITLE: DACA41-86-C-0061      FT LEAVENWORTH ESOS      LCCID 1.001  
REGION NO. 7

FISCAL YEAR 1987      DISCRETE PORTION NAME: GROUP 7  
ANALYSIS DATE: 07-10-87      ECONOMIC LIFE 25 YEARS      PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	35589.
B. SIOH	\$	3559.
C. DESIGN COST	\$	1779.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	36835.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	36835.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	332.	\$ 5142.	11.05	56820.
B. DIST	\$ .00	0.	\$ 0.	16.73	0.
C. RESID	\$ .00	0.	\$ 0.	17.67	0.
D. NAT G	\$ 3.15	0.	\$ 0.	19.36	0.
E. COAL	\$ .00	0.	\$ 0.	13.47	0.
F. TOTAL		332.	\$ 5142.		\$ 56820.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	11.65	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	18751.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	_____	
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	5142.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	56820.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	1.54	
(IF < 1 PROJECT DOES NOT QUALIFY)		

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent age

[illegible]

Replacing existing motors of greater than 1 HP on HVAC equipment or equipment that runs at least 4380 hours per year, with higher efficiency motors will provide the same horsepower requirements at a lower cost. The high efficiency motors run cooler, extending their life and in some cases, reduce the air conditioning load.

NAME	ORGANIZATION	TELEPHONE NO.	SIGNATURE	N

TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT NO YES	ESTIMATED COST	WORK TO BE PERFORMED	FROM
	<input type="checkbox"/> APPROVAL <input type="checkbox"/> DISAPPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS	FUNDED \$ _____ WC <u>K</u> \$ <u>29,887</u>	<input type="checkbox"/> IN-HOUSE <input type="checkbox"/> SELF-HELP <input type="checkbox"/> CONTRACT <input type="checkbox"/> TROOP	_____ FACILITIES _____ DATE
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED	WC <u>L</u> \$ _____ WC _____ \$ _____		
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	UNFUNDED \$ <u>1,360</u> TOTAL \$ <u>31,247</u>		
APPROVING AUTHORITY _____					

ACTION TAKEN														DATE				SIGNATURE OF APPROVAL AUTHORITY				FORWARD			
														MO		DA						DESIGN			
														MO	DA	MO	DA					MO	DA	MO	DA
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	SIGNATURE OF APPROVAL AUTHORITY				19	20	21	22
X	F	I	C																						

DA FORM 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

WHITE (OR  
PINK

①

# JEERING WORK REQUEST – XFA, XFB, XFC

A Pam 420-6: the proponent agency is the Office of the Chief of Engineers.

ACTION		SHORT JOB DESCRIPTION																																												BUILDING/FACILITY				BLANK									
																																														NUMBER		SUFFIX											
36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80															
		Replace motors																																												P 0 0 2 5													
BUILDING/FACILITY		BUILDING/FACILITY				BUILDING/FACILITY				BUILDING/FACILITY				BUILDING/FACILITY				BLANK																																									
SUFFIX		NUMBER				SUFFIX				NUMBER				SUFFIX								NUMBER				SUFFIX																																	
36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80															
EQUIPMENT THAT PROVIDE THE MOTORS RUN COOLER, ETC.		DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																									
		<p>Old motors will continue to use more energy. When they fail, they are more likely to be replaced with a similar low efficiency motor than a high efficiency one. Most are almost always required quickly to get the equipment operating as soon as possible. This ECO will save approximately 784 million BTU's per year.</p>																																																									
		PERSON TO CALL FOR ADDITIONAL INFORMATION																																																									
NAME		ORGANIZATION																												TELEPHONE NO.																													

WORK TO BE PERFORMED  IN-HOUSE SELF-HELP CONTRACT TROOP		FROM  FACILITIES ENGINEER  DATE																																
<table border="1"> <tr> <th colspan="8">FORWARDED TO</th> </tr> <tr> <th colspan="4">DESIGN</th> <th colspan="4">ESTIMATOR</th> </tr> <tr> <th>MO</th><th>DA</th><th>MO</th><th>DA</th><th>MO</th><th>DA</th><th>MO</th><th>DA</th> </tr> <tr> <td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> </table>			FORWARDED TO								DESIGN				ESTIMATOR				MO	DA	MO	DA	MO	DA	MO	DA	19	20	21	22	23	24	25	26
FORWARDED TO																																		
DESIGN				ESTIMATOR																														
MO	DA	MO	DA	MO	DA	MO	DA																											
19	20	21	22	23	24	25	26																											
L AUTHORITY																																		

APPROVED FOR DESIGN   SIGNATURE _____ DATE _____	SOURCE OF FUNDS  <input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.
REMARKS	

WHITE (ORIGINAL) – PROJECT FILE COPY  
 PINK – FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK

GREEN – FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2



**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
---------------	-----	------------------------------	-------------------------	-----------------------	--------------------------	-----

	<b>GROUP 8</b> Building 225						
225	Building 225	ECO-A4	160.0	\$3,926	\$18,784	4.8	2.28
225	Building 225	ECO-M3	346.0	\$1,091	\$11,230	10.3	1.32
	GROUP 8 TOTALS		506.0	\$5,017	\$30,014	6.0	2.18

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  HAND CALCULATIONS _____ COMPUTER CALCULATIONS _____ CONTRACTOR BID _____ X OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #225 A4 SOLAR FILM</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 611.00 MBTU  
 INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 681.00 MBTU

EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 1,077.00 MBTU  
 INSULATION BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 800.00 MBTU

MBTU'S SAVED PER YR. 207.00 MBTU

HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL MBTU'S SAVED PER YEAR  
 -70.00 / 60% = -116.67

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 -116.67 X \$3.15 = (\$368)

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 277.00 X \$15.50 = \$4,294

ENERGY SAVINGS PER YEAR	\$3,926
-------------------------	---------

INSTALL INTERIOR SOLAR FILM ON WEST  
AND EAST WINDOWS

INSTALL INTERIOR SOLAR  
FILM ON EAST AND SOUTH  
WINDOWS



<b>ENERGY SAVINGS CALCULATION SHEET</b>		<b>DATE PREPARED</b> 7/10/87	<b>SHEET</b> 0F 1 1	
<b>PROJECT</b>	<b>FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY</b>		<b>BASIS FOR CALCULATION</b>  X HAND CALCULATIONS COMPUTER CALCULATIONS CONTRACTOR BID OTHER (SPECIFY)	
<b>LOCATION</b>	BUILDING# 225			
<b>ARCHITECT/ENGINEER</b>	CLARK RICHARDSON & BISKUP			
<b>ECO MEASURE</b>	<b>BOILER OXYGEN TRIM CONTROL</b>		<b>COMPUTED BY</b> MAW	<b>CHECKED BY</b> DEC

**BUILDING 225 - BOQ**

TEST DATA, BOILER #1, KEWANEE FIRE TUBE, 125 HP

4,184,375 BTUH INPUT

% OXYGEN 8. %

STACK TEMPERATURE 245 ° F

% EXCESS AIR 58. %

EFFICIENCY 82.20%

%CO 2 7.6 %

BOILER WAS AT APPROXIMATELY 50% CAPACITY

BOILER OPERATED FULL TIME CYCLING APPROX. 50% ON 50% OFF.

BOILER TRIM CONTROL REDUCES EXCESS AIR TO 15%

FROM "GAS COMBUSTION EFFICIENCY CHART" PUBLISHED BY COOPERATIVE EXTENSION SERVICE,  
KANSAS STATE UNIVERSITY, MANHATTAN KS.

15% EXCESS AIR AT 317°F = 84.50% COMBUSTION EFF.

84.50% - 82.20% = 2.30% INCREASE IN COMB. EFF.

7 MONTHS /YR X 24 HRS/ DAY = 5000 HOURS OF OPERATION PER YEAR

ASSUMING BOILER OPERATES AT CONSTANT 50% OF PEAK

4.185 MBTUH X 0.5 X 5000 = 10,462.50 MBTU/YR

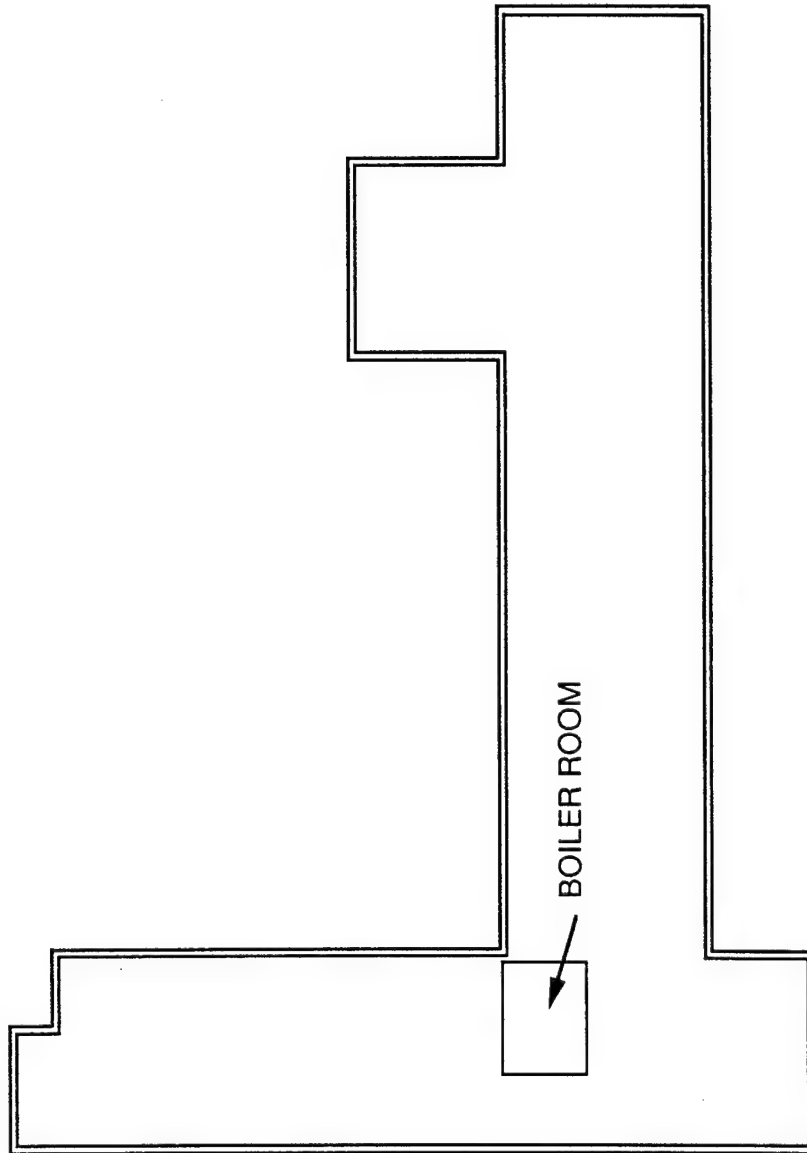
10,462.50 / 82.20% = 12,728.10 MBTU/YR

10,462.50 / 84.50% = 12,381.66 MBTU/YR

**SAVINGS**

12,728.10 - 12,381.66 = 346.44 MBTU/YR

3.15 X 346.44 = \$1,091 PER YEAR



**BUILDING 225**  
Not to Scale

ECO-M3

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT LEAVENWORTH      STUDY: FTLVGRUP  
PROJECT NO. & TITLE: DACA41-86-C-0061      FT LEAVENWORTH ESOS      LCCID 1.001      REGION NO. 7

FISCAL YEAR 1987      DISCRETE PORTION NAME: GROUP8  
ANALYSIS DATE: 07-10-87      ECONOMIC LIFE 25 YEARS      PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	27285.
B. SIOH	\$	2729.
C. DESIGN COST	\$	1364.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	28240.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	28240.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	277.	\$ 4296.	11.05	47469.
B. DIST	\$ .00	0.	\$ 0.	16.73	0.
C. RESID	\$ .00	0.	\$ 0.	17.67	0.
D. NAT G	\$ 3.15	229.	\$ 721.	19.36	13965.
E. COAL	\$ .00	0.	\$ 0.	13.47	0.
F. TOTAL		506.	\$ 5017.		\$ 61434.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	11.65	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	20273.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F=		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	5017.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	61434.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	2.18	
(IF < 1 PROJECT DOES NOT QUALIFY)		

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent a

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED			
<p>Building 225, BOQ &amp; Dinning facility, has two opportunities for energy savings.  <u>Install Solar film</u> - will reduce the solar heat gain in the summer from the south and west facing windows. Approximately 1/4 of the wall area on the south and west walls is glass which results in significant solar heat gain during the summer months.  <u>Oxygen trim control</u> for the boilers would improve the efficiency of the boilers and provide building heating at a lower cost.</p>			
REQUESTER INFORMATION			
NAME	ORGANIZATION	TELEPHONE NO.	SIGNATURE

FORWARD FOR APPROVAL					
TO	RECOMMENDED ACTION	ENVIRONMENTAL IMPACT NO YES	ESTIMATED COST	WORK TO BE PERFORMED	FROM
	<input type="checkbox"/> APPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL CONSIDERATIONS	FUNDED \$ _____	<input type="checkbox"/> IN-HOUSE	FACILITIES  DA
	<input type="checkbox"/> DISAPPROVAL	<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA INITIATED	WC <u>K</u> \$ <u>30,014</u>	<input type="checkbox"/> SELF-HELP	
		<input checked="" type="checkbox"/> <input type="checkbox"/> EIS/EIA COMPLETED	WC <u>L</u> \$ _____	<input type="checkbox"/> CONTRACT	
			WC _____ \$ _____	<input type="checkbox"/> TROOP	
APPROVING AUTHORITY _____			UNFUNDED \$ <u>1,364</u>		
			TOTAL \$ <u>31,378</u>		

														APPROVAL ACTION						
INS CODE			CHANGE	DOCUMENT NUMBER										ACTION TAKEN	DATE			FORWARD		
				REQ ID	SERIAL NUMBER				FY	TYPE	MO	DA	DESIGN							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
X	I	C	C											A - APPROVED				SIGNATURE OF APPROVAL AUTHORITY		
														D - DISAPPROVED						

ENGINEERING WORK REQUEST - XFA, XFB, XFC  
Pam 420-6: the proponent agency is the Office of the Chief of Engineers.

TJON	SHORT JOB DESCRIPTION																																																							BUILDING/FACILITY		BLANK																							
																																																								NUMBER	SUFFIX																								
36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																					
Energy savings building 225																																																																																	
FACILITY		BUILDING/FACILITY					BUILDING/FACILITY					BUILDING/FACILITY					BUILDING/FACILITY					BLANK																																																											
SUFFIX		NUMBER					SUFFIX					NUMBER					SUFFIX							NUMBER					SUFFIX																																																				
6	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																																					
Energy savings building 225																																																																																	
DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED		The building will continue to waste heating and cooling energy. This ECO will save approximately 506 million BTU's per year.																																																																															
PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																																	
NAME		ORGANIZATION																																																							TELEPHONE NO.																								

K TO BE FORMED		FROM	
HOUSE		FACILITIES ENGINEER	
LF-HELP		DATE	
CONTRACT			
LOOP			
APPROVED FOR DESIGN		SOURCE OF FUNDS	
SIGNATURE		DATE	
REMARKS		<input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.	
FORWARDED TO			
DESIGN		ESTIMATOR	
MO DA MO DA			
19 20 21 22 23 24 25 26			
AUTHORITY			

WHITE (ORIGINAL) - PROJECT FILE COPY  
PINK - FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL ACTION" BLOCK  
GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

2



**ENERGY CONSERVATION ANALYSIS  
ESOS**

PROJECT GROUP		ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
<b>GROUP 9</b> Building 56							
56	Building 56	ECO-A2	243.0	\$1,335	\$17,615	13.2	1.20
56	Building 56	ECO-A3	123.0	\$893	\$5,455	6.1	2.34
56	Building 56	ECO-A4	30.0	\$637	\$5,286	8.3	1.34
56	Building 56	ECO-A6	64.0	\$767	\$7,884	10.3	1.21
56	Building 56	ECO-E3	88.0	\$2,112	\$18,594	8.8	1.24
GROUP 9 TOTALS			548.0	\$5,744	\$54,834	9.5	1.34

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  _____ HAND CALCULATIONS _____ COMPUTER CALCULATIONS _____ CONTRACTOR BID _____ X OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #56 A-2 THERMOPANE GLASS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,167.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>2,970.00</u>

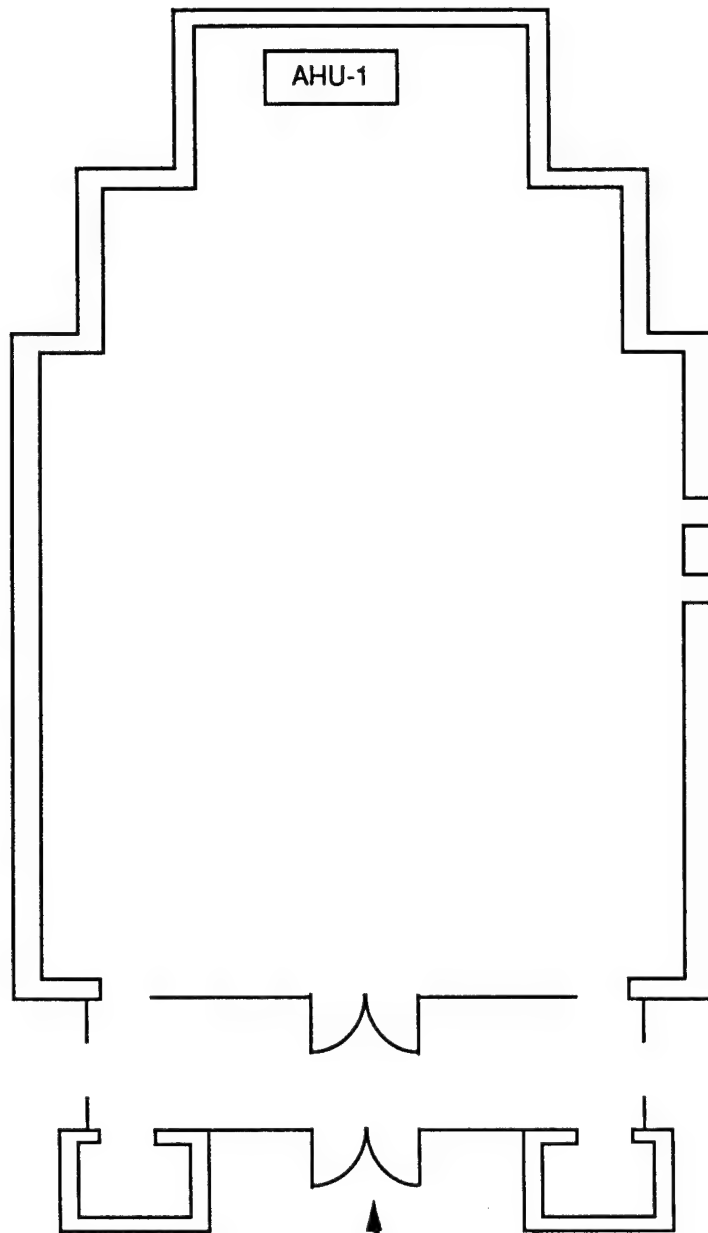
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>417,025.00</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>403,530.00</u>

MBTU'S SAVED PER YR. 243.06 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 197.00 X \$3.15 = \$621

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 46.06 X \$15.50 = \$714

ENERGY SAVINGS PER YEAR	\$1,334
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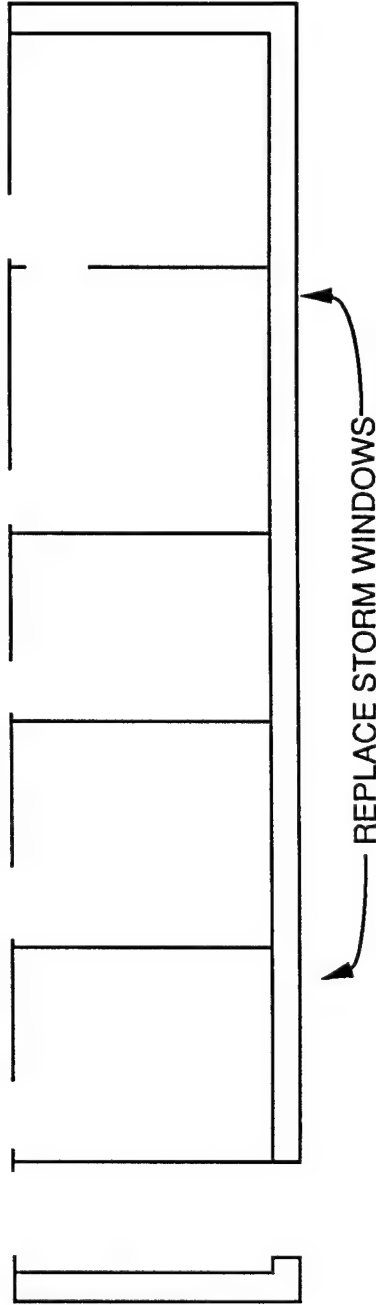
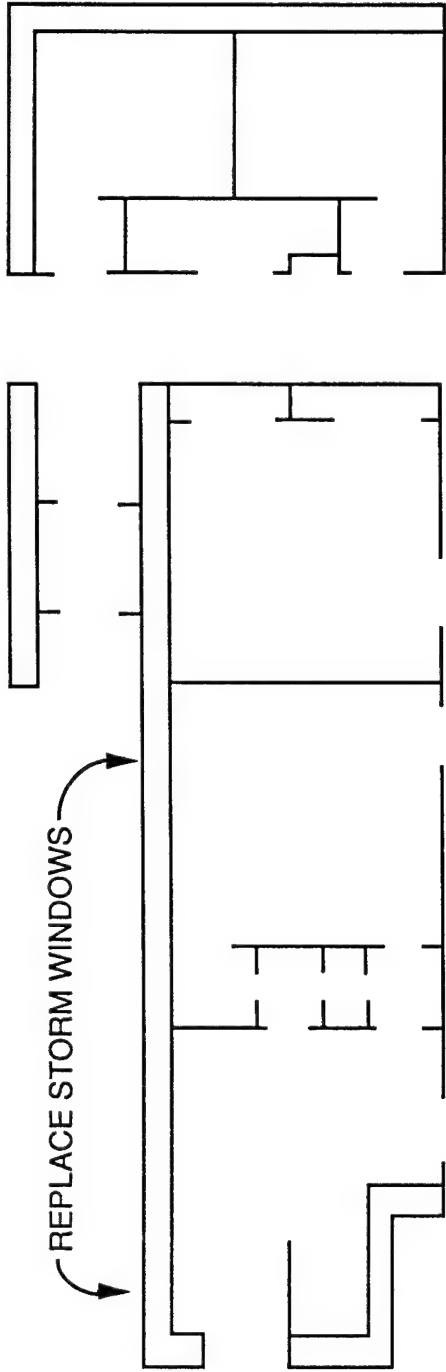
INSTALL DOUBLE INSULATED  
STORM WINDOWS OVER EXISTING  
STAINED GLASS WINDOWS



**BUILDING 56 - CHAPEL**

Not to Scale

ECO-A2



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED 2/87	SHEET OF 1 1
PROJECT ESOS		BASIS FOR CALCULATION  HAND CALCULATIONS _____ COMPUTER CALCULATIONS _____ CONTRACTOR BID _____ X OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BUILD #56 A3 WEATHERIZATON SAVINGS		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,167.00</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,085.00</u>

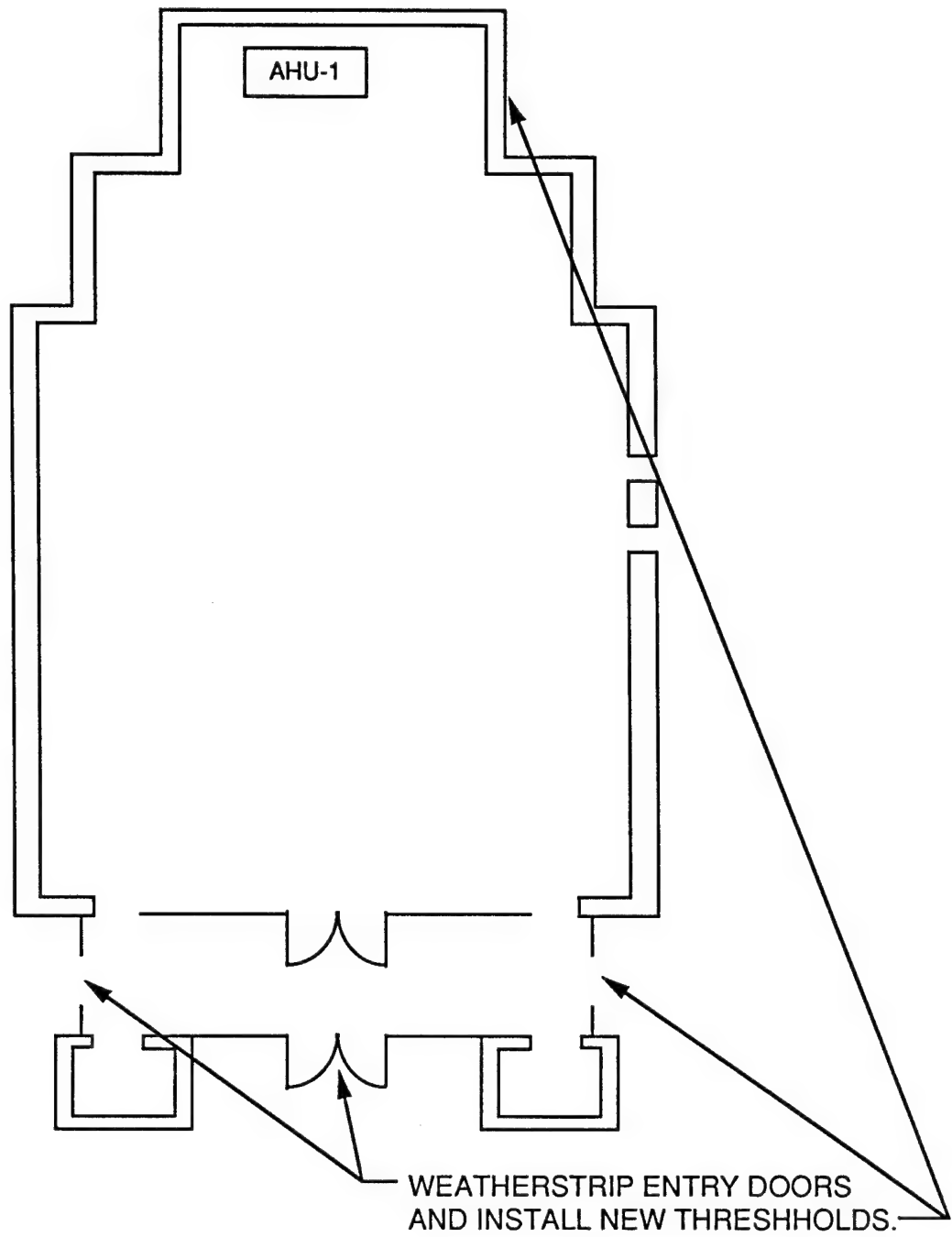
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>417,025</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>405,035</u>

MBTU'S SAVED PER YR. 122.92 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 82.00 X \$3.15 = \$258

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 40.92 X \$15.50 = \$634

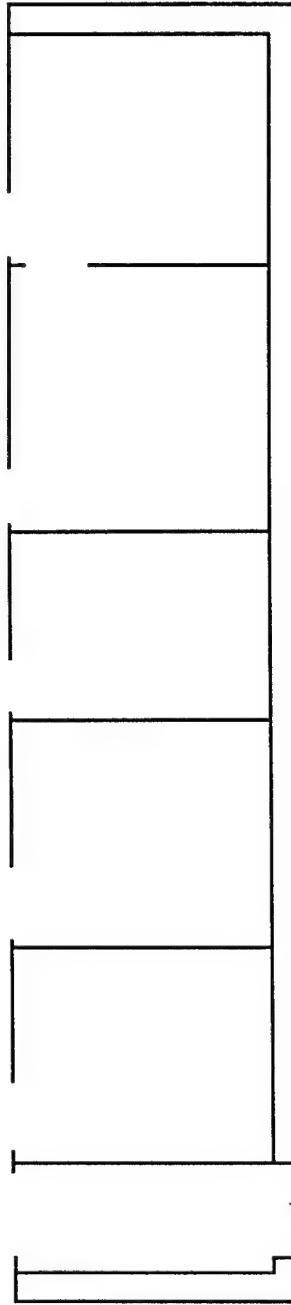
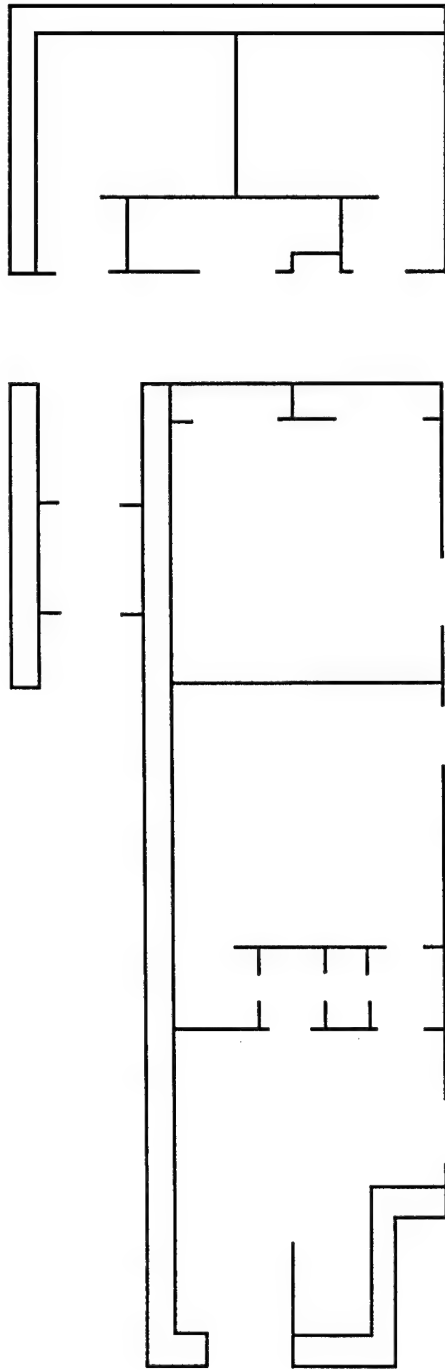
ENERGY SAVINGS PER YEAR	\$893
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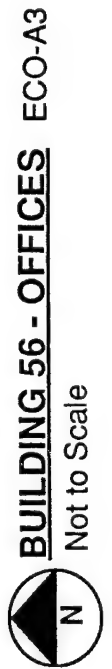
**BUILDING 56 - CHAPEL**

Not to Scale

ECO-A3

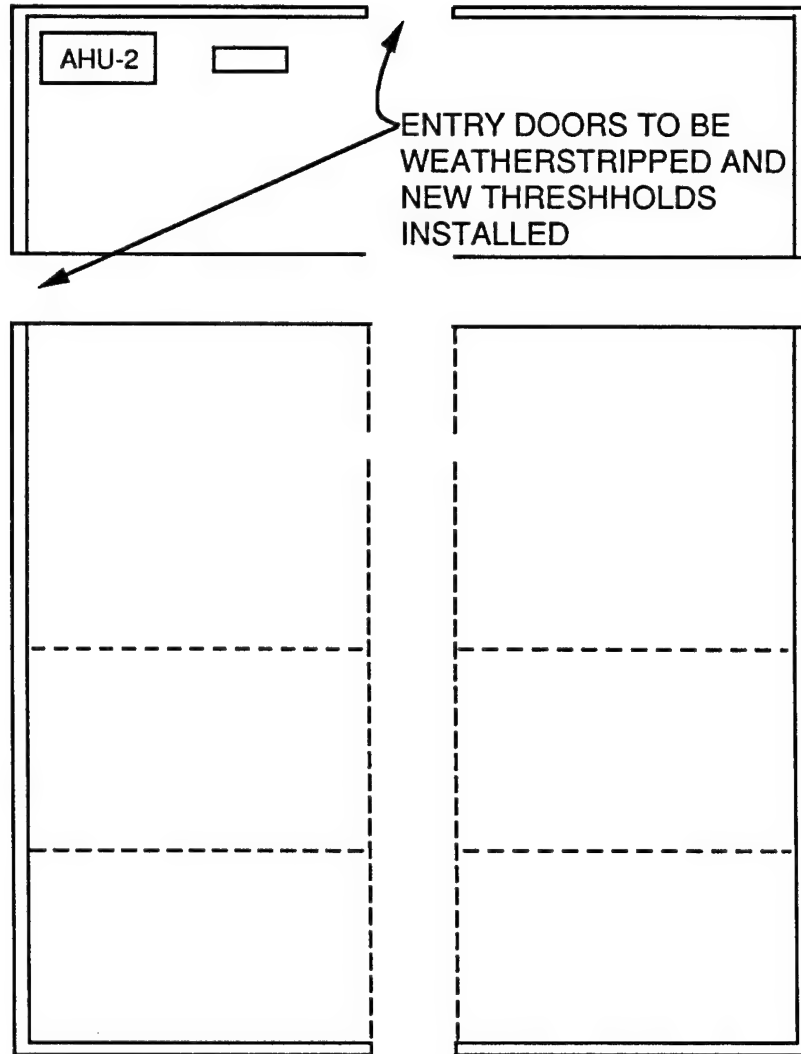


ENTRY DOORS TO BE  
WEATHERSTRIPPED AND INSTALLATION  
OF NEW THRESHHOLDS



**BUILDING 56 - OFFICES** ECO-A3

Not to Scale



**BUILDING 56 - Assembly Room**

ECO-A3

Not to Scale



ENTRY DOORS TO BE  
WEATHERSTRIPPED  
AND NEW THRESHHOLDS  
INSTALLED

ENTRY DOORS TO BE  
WEATHERSTRIPPED AND  
NEW THRESHHOLDS  
INSTALLED



**BUILDING 56 - Classrooms** ECO-A3  
Not to Scale

ENERGY SAVINGS CALCULATION SHEET		DATE PREPARED 2/87	SHEET 1 OF 1
PROJECT ESOS		BASIS FOR CALCULATION  <input type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION FORT LEAVENWORTH			
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP			
ECO MEASURE BLDG. #56 A-4 SOLAR FILM SAVINGS		COMPUTED BY DLH	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,167.61</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,181.55</u>

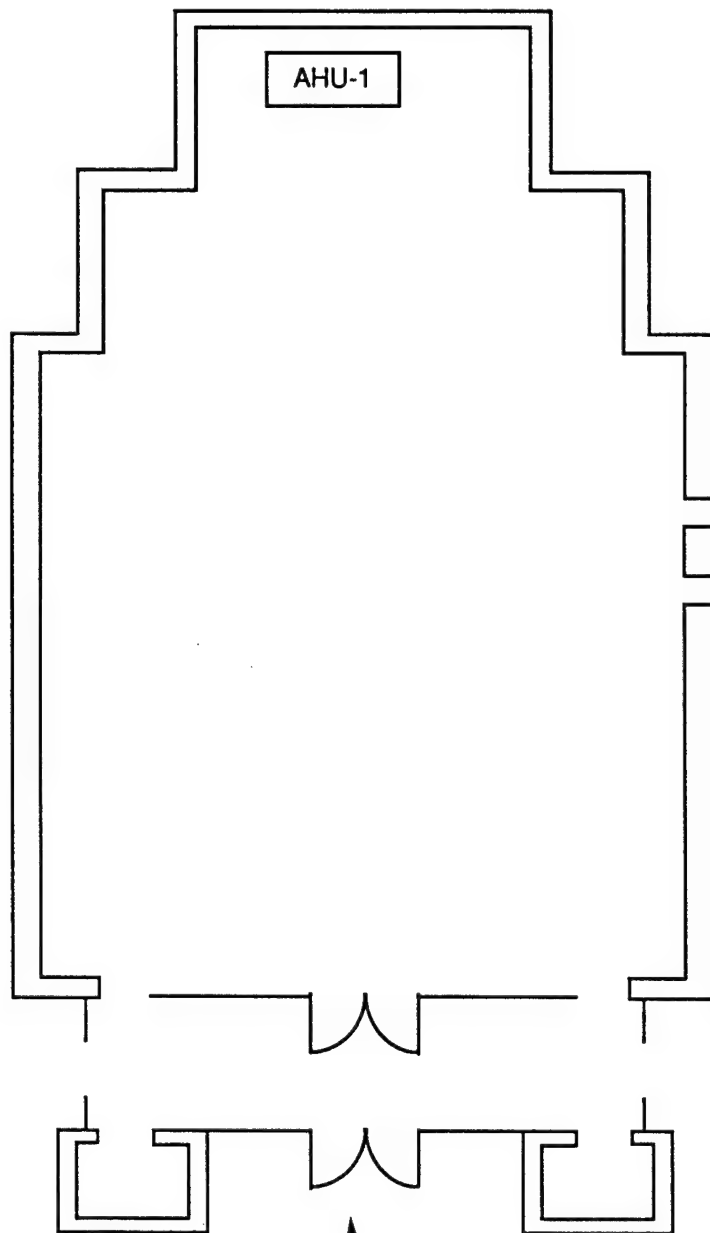
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>417,025</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>404,152</u>

MBTU'S SAVED PER YR. 30.00 MBTU

HEATING MBTU SAVED PER YEAR	X	AVERAGE DOLLARS PER MBTU	=	DOLLARS SAVED PER YEAR
-13.94		\$3.15		(\$44)

COOLING MBTU SAVED PER YEAR	X	AVERAGE DOLLARS PER MBTU	=	DOLLARS SAVED PER YEAR
43.94		\$15.50		\$681

ENERGY SAVINGS PER YEAR	\$637
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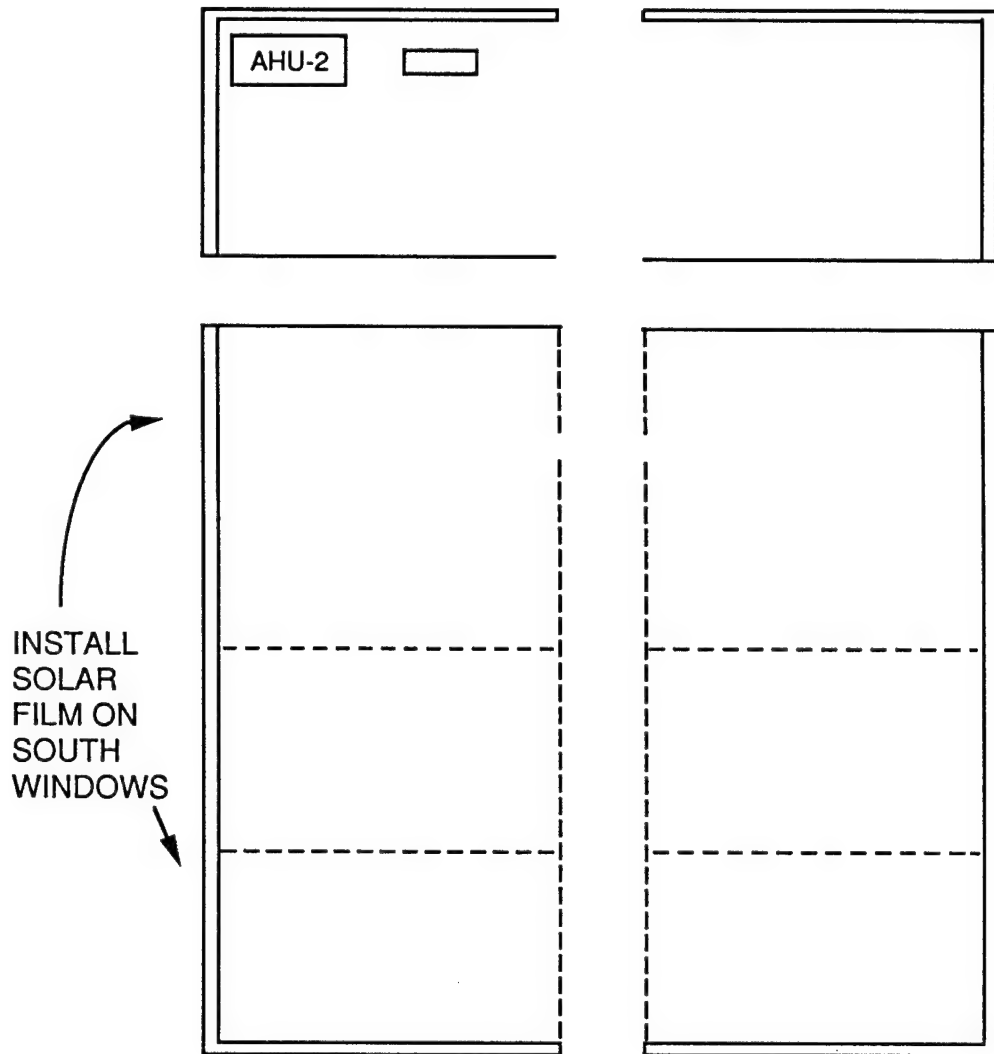
INSTALL SOLAR FILM ON  
SOUTH ENTRY PORTICO  
CLEAR STORY WINDOWS



**BUILDING 56 - CHAPEL**

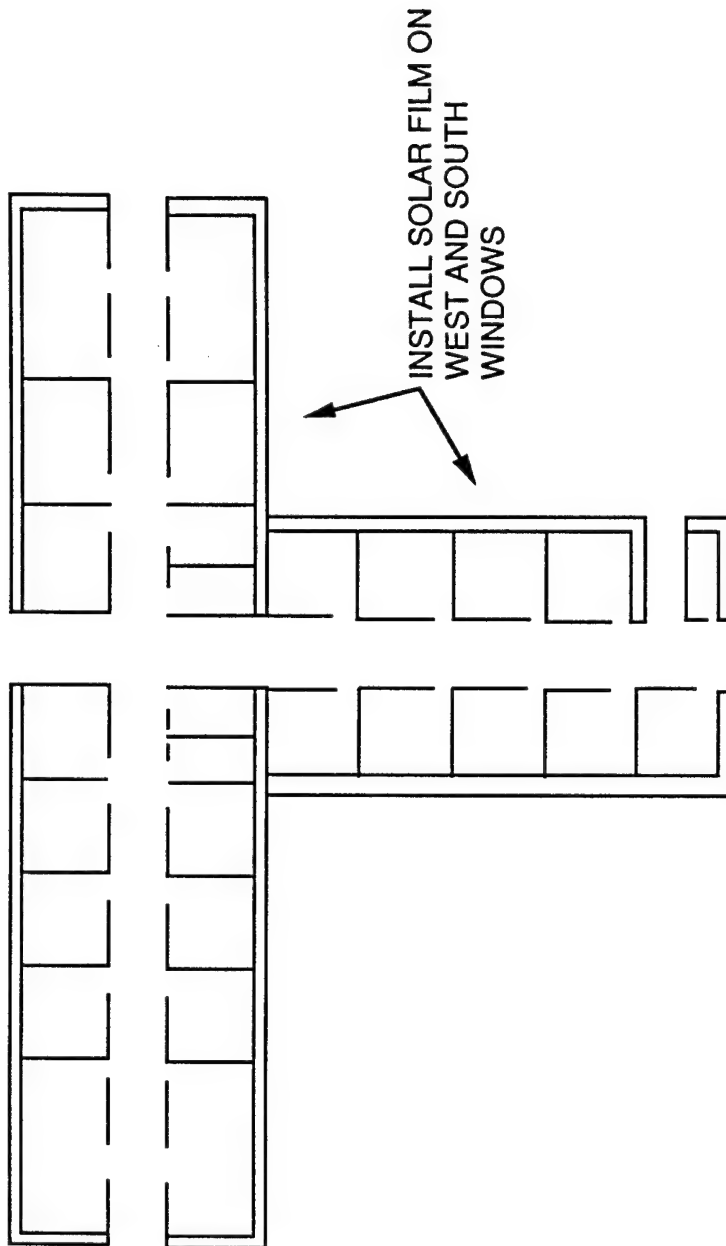
Not to Scale

ECO-A4



**BUILDING 56 - Assembly Room** ECO-A4

Not to Scale



<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  HAND CALCULATIONS X COMPUTER CALCULATIONS _____ CONTRACTOR BID _____ OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #56 A-6 REDUCE GLASS AREA SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,167.61</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,149.52</u>

EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>417,025</u>
MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR.)	<u>403,608</u>

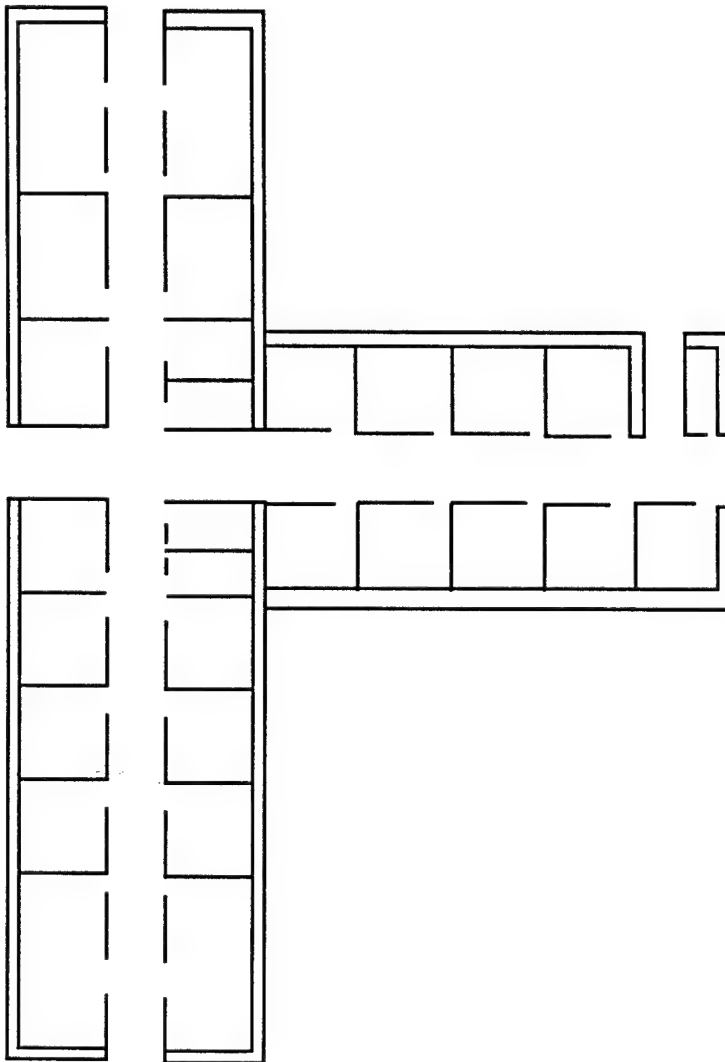
MBTU'S SAVED PER YR. 63.88 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 18.09 X \$3.15 = \$57

COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR  
 45.79 X \$15.50 = \$710

ENERGY SAVINGS PER YEAR	\$767
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REMOVE AND FILL  
CENTER WINDOWS  
FOR CLASSROOMS ON  
NORTH WALL



 **BUILDING 56 - Classrooms ECO-A6**  
Not to Scale

<b>ENERGY SAVINGS CALCULATION SHEET</b>		DATE PREPARED <b>2/87</b>	SHEET OF <b>1 1</b>
PROJECT <b>ESOS</b>		BASIS FOR CALCULATION  <input checked="" type="checkbox"/> HAND CALCULATIONS <input type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
LOCATION <b>FORT LEAVENWORTH</b>			
ARCHITECT/ENGINEER <b>CLARK RICHARDSON &amp; BISKUP</b>			
ECO MEASURE <b>BLDG. #56 E-3 REPLACE INCANDESCENT SAVINGS</b>		COMPUTED BY <b>DLH</b>	CHECKED BY

### ENERGY SAVINGS

EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,167.61</u>
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.)	<u>3,228.83</u>

EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>417,025</u>
MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH PER YR.)	<u>373,461</u>

MBTU'S SAVED PER YR. 87.46 MBTU

HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

-61.22	X	\$3.15	=	(\$193)
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ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR

148.68	X	\$15.50	=	\$2,305
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ENERGY SAVINGS PER YEAR	\$2,112
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<b>ENERGY SAVINGS CALCULATION SHEET</b>		<b>DATE PREPARED</b> 2/6/87	<b>SHEET OF</b> 1 1
<b>PROJECT</b> ESOS		<b>BASIS FOR CALCULATION</b>  <input type="checkbox"/> HAND CALCULATIONS <input checked="" type="checkbox"/> COMPUTER CALCULATIONS <input type="checkbox"/> CONTRACTOR BID <input type="checkbox"/> OTHER (SPECIFY) BIN METHOD	
<b>LOCATION</b> FORT LEAVENWORTH			
<b>ARCHITECT/ENGINEER</b> CLARK RICHARDSON & BISKUP			
<b>ECO MEASURE</b> E-3 INCANDESCENT REPLACEMENT SAVINGS		<b>COMPUTED BY</b> WBF	<b>CHECKED BY</b> MAW

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

**BUILDING #56      10926 TOTAL WATTS REDUCTION**

EXTERIOR - CHANGE 14 -100W CHANDELIER TO 40W.  
 ENTRY VEST - CHANGE 9 -100W LAMPS TO 50W. 1290 W

KITCHEN - CHANGE 18 -100W LAMPS TO 90W.  
 OFFICES - CHANGE 41 -100W LAMPS TO 90W.  
 CHAPEL - CHANGE 120 - 100W LAMPS TO 90W.  
 DRESSING RM - CHANGE 5 - 100W LAMPS TO 90W  
 JANITOR - CHANGE 2 - 100W LAMPS TO 90W  
 STORAGE - CHANGE 1 - 100W LAMPS TO 90W  
 SOUTH ENT. - CHANGE 2 - 100W LAMPS TO 90W 1890 W

BAPTIS/CHAPLE FRONT - CHANGE 15 - 150W FLOOD LAMPS TO 120W. 450 W  
 LOUNGE/ACT ROOM - CHANGE 36 - 150W FLOODS TO 55W. 3420 W

CORR./TOILETS - REPLACE 57 -100W INCAN. FIXTURES WITH 32W FLUOR. FIXTURES. 3876 W

For use of this form, see AR 420-17 and DA Pam 420-6; the proponent agency

DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED

Building 56, Post Chapel has several energy conservation opportunities. Thermopane windows to replace old single pane windows, will reduce solar heat gain in the summer and heat losses in the winter. Weatherstripping doors and windows that are not replaced, will reduce infiltration and improve comfort. Solar film on windows not replaced. Will reduce solar heat gain in the summer. Reducing glass area by infilling some unnecessary windows with insulated panels, will reduce solar heat gain and winter heat losses. Replacing incandescent lighting with lower wattage bulb and fluorescent fixture will reduce the electrical energy used for lighting & air conditioning.

## REQUESTER INFORMATION

FORWARD FOR APPROVAL

### APPROVAL ACTION

DA FORM 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED

WHITE (OR  
PINK

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1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1

m 420-6: the proponent agency is the Office of the Chief of Engineers.

IN	SHORT JOB DESCRIPTION																																																																	BUILDING/FACILITY								BLANK																					
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es. olar ping l olar ressary heat fluorescent ditioning.					DESCRIBE WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHED																																																																																										
					The building would continue to waste energy unnecessarily, and occupants would continue to complain about poor space conditioning. These complaints waste time and resources. The building would save approximately 548 million BTU's per year.																																																																																										
					PERSON TO CALL FOR ADDITIONAL INFORMATION																																																																																										
					NAME																									ORGANIZATION																														TELEPHONE NO.																																			

TO BE MED		FROM	
		FACILITIES ENGINEER	
		DATE	

FORWARDED TO							
DESIGN				ESTIMATOR			
MO	DA	MO	DA	MO	DA	MO	DA
19	20	21	22	23	24	25	26

AUTHORITY

APPROVED FOR DESIGN		SOURCE OF FUNDS
SIGNATURE _____ DATE _____		<input type="checkbox"/> DIRECT <input type="checkbox"/> AUTOMATIC REIMB. <input type="checkbox"/> FUNDED REIMB.
REMARKS		

**PINK**

- FORWARD TO KEYPUNCH AFTER COMPLETION  
OF "APPROVAL ACTION" BLOCK

**GREEN - FORWARD TO KEYPUNCH AFTER  
COMPLETION OF "FORWARD FOR  
APPROVAL" BLOCK**

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LIFE CYCLE COST ANALYSIS SUMMARY  
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)  
INSTALLATION & LOCATION: FT LEAVENWORTH  
PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

STUDY: FTLVGRUP  
LCCID 1.001

REGION NO. 7

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP9

ANALYSIS DATE: 07-10-87

ECONOMIC LIFE 25 YEARS

PREPARED BY: CRB

1. INVESTMENT

A. CONSTRUCTION COST	\$	49849.
B. SIOH	\$	4985.
C. DESIGN COST	\$	2492.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	51594.
E. SALVAGE VALUE COST	-\$	0.
F. TOTAL INVESTMENT (1D-1E)	\$	51594.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 15.50	326.	\$ 5045.	11.05	55750.
B. DIST	\$ .00	0.	\$ 0.	16.73	0.
C. RESID	\$ .00	0.	\$ 0.	17.67	0.
D. NAT G	\$ 3.15	222.	\$ 699.	19.36	13526.
E. COAL	\$ .00	0.	\$ 0.	13.47	0.
F. TOTAL		547.	\$ 5744.		\$ 69276.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	11.65	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	22861.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	_____	
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$	5744.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	69276.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=	1.34	
(IF < 1 PROJECT DOES NOT QUALIFY)		